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EFFECT OF RESISTANCE TRAINING, MENTAL TRAINING AND COMBINED TRAINING ON SELECTED MOTOR, PSYCHOLOGICAL AND VOLLEYBALL SKILL RELATED VARIABLES AMONG COLLEGE MEN VOLLEYBALL PLAYERS

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Dr S Jayakumar

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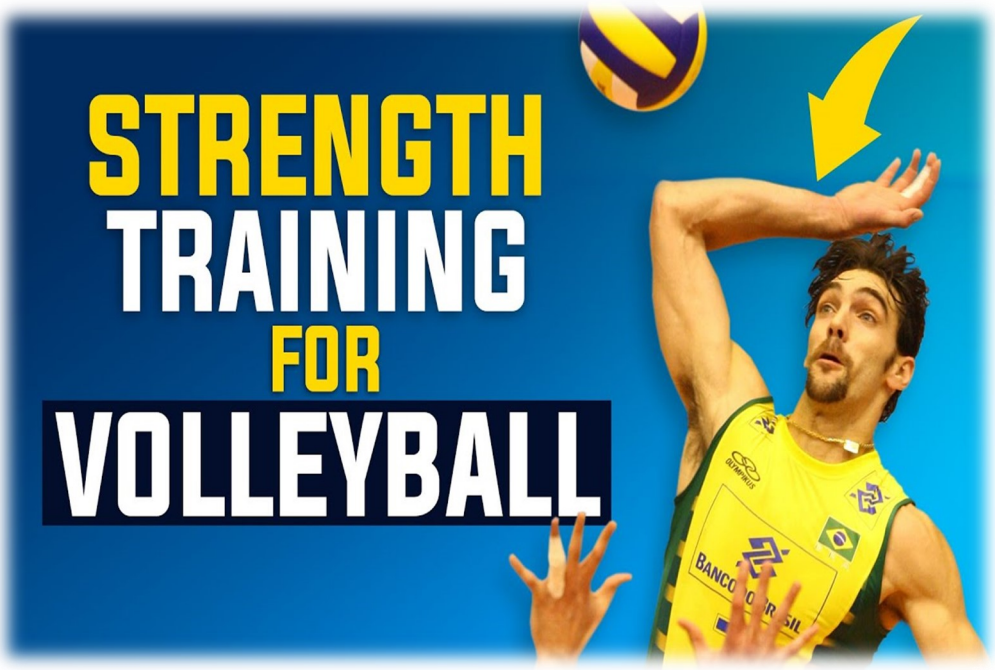

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A THESIS

Submitted by

JAYAKUMAR S

in partial fulfillment for the award of the degree of

DOCTOR OF PHILOSOPHY

Department of Physical Education and Health Science
FACULTY OF HUMANITIES AND SCIENCES

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SEPTEMBER 2015

ABSTRACT

William G. Morgan, an instructor in YMCA had a great desire and dream to introduce a suitable game without much body contact and to incorporate many rules and intricacies of basketball, baseball, tennis and handball for all age group and both the sexes to play in a limited space. He tailored a game with a name mintonette with a barrowed tennis net. He raised the net to 6 feet 6 inches above the floor just above the height of an average American. By the actions of volleying the volleying the back and forth to either side of the net might have brought the name of Volleyball to the game invented 120 years back.

The present study was to compare and critically analyze the impact of resistance training, mental training and combined training on the selected motor fitness, psychological and volleyball playing skill related variables among men volleyball players of age between 19 and 24 years. To achieve this purpose, 120 male volleyball players were selected at random from among the players who had participated in some form of competitive volleyball representing Velammal engineering college, Chennai city who expressed their willingness to participate in the study. They were explained about their role in the study and they were requested to extend their best cooperation in making the purpose of the study meaningful and useful to other public at large. They were informed of the purpose of the study and that they had to be in the experiment for a period of 12 weeks and follow the guidelines of the scholar.

It was hypothesized that

1. There would be a significant difference on the selected motor variables among the resistance training group, mental training group, combined training group and the control group.

2. There would be a significant difference on the selected psychological variables among the resistance training group, mental training group, combined training group and the control group.

3. There would be a significant difference on the selected volleyball skill related variables among the resistance training group, mental training group, combined training group and the control group.

The scholar in his present study, decided to experiment the following motor behaviour after a due consideration and experimentation,

1. Agility
2. speed
3. leg explosive power

The researcher decided as important the following psychological variables:

1. Sports Competition Anxiety
2. Achievement Motivation
3. Self Confidence

For the present study, the researcher selected the following volleyball playing skills:

1. Serving
2. Volleying and
3. Spiking

The Resistance training group consisted of 30 men volleyball players who performed a set of 7 resistance training exercises, three times daily for 45 minutes for 2 days (Mondays and Fridays) in a week under the supervision of the scholar in the school auditorium between 5 and 6 pm. The schedule is given below. The same group walked on sand track for 100 metres and ran back as fast as they can for 3 days (Tuesdays, Wednesdays and Thursdays) in a week.

The Mental training group was trained with the Mental Skills and the mental skills that were necessary for performing well in sport as well as in non-sport performance situations.

The Combined training group was having the following weekly schedule:

Monday:	Weight training for 1 hour with resistance training group
Tuesday:	Mental Training session with mental training group
Wednesday:	Sand running programme for 1 hour with the resistance training group
Thursday:	Mental Training session with mental training group
Friday:	Weight training for 1 hour with resistance training group

The control group with 30 members was instructed that they should not indulge in any type of organized physical training programmes or some other types of psychological counseling. But they were allowed to play usual volleyball practice sessions with the other group members.

The investigator explained the purpose of the study to the subjects and their role in the study. For the collection of data, the investigator explained the procedure of testing the selected dependent variables and gave instructions about the procedure to be adopted by them for measuring. The subjects of all the groups were sufficiently motivated to perform their maximum level during the testing periods.

The data were collected from the Resistance training, Mental training, the Combined and the Control groups on selected motor, psychological and volleyball playing skills variables among men volleyball players of age groups between 19 and 24 years. The experimental design for the study was static group comparison design. Analysis of covariance ANCOVA was used to find out the difference among the Resistance training, Mental training, the Combined and the Control groups on selected motor, psychological and volleyball playing skills variables. If the obtained F-ratio was significant, the Scheffe's test was used as a post-hoc test to find out the significant difference between each variable. In all the cases, 0.05 level of significance was used to test the hypotheses.

The data thus collected before the experimental administration of the programmes were recorded as Pre Test scores. After the experimental period of 12 weeks, the measurements were made and recorded as the post-test Scores. The eating habits, the profession and the economic and socio-cultural factors of the participants were not taken into account during the process of the statistical process. The collected data were subjected to ANCOVA

1. The hypothesis that there would be a significant difference on the selected motor variables among the resistance training group, mental training group, combined training group and the control group was accepted.

2. The hypothesis that there would be a significant difference on the selected psychological variables among the resistance training group, mental training group, combined training group and the control group was accepted.

3. The hypothesis that there would be a significant difference on the selected volleyball skill related variables among the resistance training group, mental training group, combined training group and the control group was accepted.

On the basis of the conclusions made, the following recommendations were made.

1. This study may be conducted for college women volleyball players and new interpretations could be made.
2. The same study might me conducted with different motor fitness variables.
3. The same study could be made with addition of physiological variables with the existing variables.
4. The same study with a different set of psychological variables could be of importance to the coaches and trainers.
5. The study with motor fitness, physiological and psychological variables with a different skills of volleyball could be studied with a larger population.
6. The same study might be of greater value if it is done with novice men or women.
7. This study with motor, physiological, psychological and biochemical variables with aerobic training, plyometric training, yoga training and resistance training may be conducted.

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S. JAYAKUMAR

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LIST OF SYMBOLS AND ABBREVIATIONS

ANCOVA	Analysis of CoVAriance
BF	biceps femoris
CIS	Canadian Interuniversity Sport
CMJ	countermovement vertical jumps
DS	dynamic stretching
GEQ	Group Environment Questionnaire
NS	no stretching
PP	peak power
PT	peak torque
RF	rectus femoris
RTD	rate of torque development
SCAT	Sports Competition Anxiety Test questionnaire
SEM	structural equation modeling
SJ	squat jump
SNA	Social Networking Analysis
SS	static stretching
STAXI	The State-Trait Anger Expression Inventory
TMG	tensiomyography
VA	Vertec attack
VB	Vertec block
VJ	vertical jumping
VL	vastus lateralis
VM	vastus medialis

Chapter I

INTRODUCTION

William G. Morgan, an instructor in YMCA had a great desire and dream to introduce a suitable game without much body contact and to incorporate many rules and intricacies of basketball, baseball, tennis and handball for all age group and both the sexes to play in a limited space. He tailored a game with a name mintonette with a barrowed tennis net. He raised the net to 6 feet 6 inches above the floor just above the height of an average American. By the actions of volleying the volleying the back and forth to either side of the net might have brought the name of Volleyball to the game invented 120 years back.

Man after his creation, was very fit naturally due to his way of life. He had to be fit for securing his food. He had to run after animals for hunting them for food for his family and himself. At the same time, he had to be fit to keep his family and himself safe from wild animals. So, entire humanity had to be fit for living a life with food and free from dangers of his environment. When they were living in jungles as society and they had two primary tasks of earning a livelihood and being safe. The lame, old and unfit died. Only the fittest survived. They were using spears and blunt weapons for hunting and saving themselves from the threat of their life. They were agile, flexible, fast and stronger to run away from the chasing animals and climb trees and rocks.

When they were exposed into modern life with fire and weapons, they were depending more on the machinery. Slowly, they learnt to adopt themselves into the modern world. They became attracted towards easy way of life due to inventions of modern gadgets. They became dependant of transport and forgot the original way of reaching places by self locomotion, walking. Still, when the science and technology advanced, the humanity became dependant on so many other mechanisms for their daily needs. Grinding on stones turned into grinding with

grinders. Pounding became nonexistent and rice mills came into existence. Washing became mechanized. Like this, the sedentary life style crept into the lives of originally fit humans.

In the leisure time, ancient humanity indulged in competitions with their spears as to how far and how accurate they could throw. They ran to find out who was the fastest. Their leisure time was decided by them and the activities were multifarious. The diverse skills of humans are today being exhibited in the modern forms of games and athletics. The activities have incarnated into the modern forms of Olympic games. The first demonstration game of mintonette or the modern volleyball was played at Springfield College after one year of the inception. After four years of the first game played, a special ball was designed. From then on, the game had grown in leaps and bounds to the level of very competitive international game involving a set of special skills and tactics and is being played throughout the world with the adopted rules. It is today a game of talent, tactics and special powers and is being competed by almost all the countries of the world. The game had become very competitive and fast. The reason behind the change in the style of the game is due to the change of rules and the techniques. The change of rules in this game demand very specific and excellent skills with every player.

Gabbett et al. (2006) investigated the effect of a skill-based training program on measurements of skill and physical fitness in talent-identified volleyball players. Twenty-six talented junior volleyball players (mean +/- SE age, 15.5 +/- 0.2 years) participated in an 8-week skill-based training program that included 3 skill-based court sessions per week. Skills sessions were designed to develop passing, setting, serving, spiking, and blocking technique and accuracy as well as game tactics and positioning skills. Coaches used a combination of technical and instructional coaching, coupled with skill-based games to facilitate learning. Subjects performed measurements of skill (passing, setting, serving, and spiking technique and accuracy), standard anthropometry (height, standing-reach height, body mass, and sum of 7 skinfolds), lower-body muscular power (vertical jump, spike jump), upper-body muscular power (over-head medicine-ball throw), speed (5-and 10-m sprint), agility (T-test), and maximal aerobic power (multistage fitness test) before and after training. The training processes induced significant ($p < 0.05$) improvements in spiking, setting, and passing

accuracy and spiking and passing technique. Compared with pre training, there were significant ($p < 0.05$) improvements in 5-and 10-m speed and agility. There were no significant differences between pre training and post training for body mass, skin fold thickness, lower-body muscular power, upper-body muscular power, and maximal aerobic power. These findings demonstrated that skill-based volleyball training improved spiking, setting, and passing accuracy and spiking and passing technique, but had little effect on the physiological and anthropometric characteristics of players.

Hillis and Okrainec (2015) purposed their study to determine if non--linear training two days a week could maintain upper and lower body strength, and vertical jump power and height over the course of a competitive volleyball season, measured at three time points. Eleven trained Canadian Interuniversity Sport (CIS) male athletes were a part of a single training group which completed a maintenance program consisting of non--linear training for 17 weeks. At each testing time point, the participants completed a bench press, squat, squat jump, countermovement jump, and three step jump and reach. We predicted that non--linear resistance training of mixed intensities twice a week would allow players to maintain strength, vertical jump power, and vertical jump height. Results indicated that upper body strength can be maintained over the course of a competition period with non--linear resistance training ($p = 0.043$). Scores for lower body strength, vertical jump squat jump power, vertical jump countermovement jump power, and vertical jump height increased over the course of the season ($p's < 0.001$, 0.14, 0.181, and 0.006, respectively). Our results indicate that male volleyball players can benefit from non--linear training to maintain or improve performance when training at > 80% 1 RM to failure once a week during a competition season.

The above studies highlight the need for the specific physical skills for being stupendous in their game. They also described the main skills as serving, volleying and spiking. To master these skills in the game, the players had to possess very good physiological proficiency. To perform the volleyball skills in an exciting and outstanding way, the physiological skills need to be very sharp and exemplary, perfect and consummate.

The reported health benefits of a more active lifestyle include diminished incidence of cardiovascular disease and certain cancers, more favourable blood lipid profiles, lesser body

weight and abdominal fat distribution, reduced blood pressure, decreased risk of osteoporosis, enhanced glucose disposal and improved psychosocial function. Unfortunately, only approximately 20% of the normal population is doing exercises with sufficient regularity to achieve optimal health benefits. The disease prevention benefits of exercise have been widely acknowledged.

1.1 Synopsis of Volleyball game

Volleyball is a game played by two teams of six players each. It is played on a rectangular court, 18 meters long and 9 meters wide, separated into two 9-meter squares by a net. The height of the net for men is 8' and for women it is 7' 4 1/4". The object of the game is to have the ball strike the floor on the opponent's side of the net on or within the boundary lines. One team serves the ball to the other team, and the team receiving the serve attempts to re-turn the ball over the net (a blocked ball does not count as one hit). The right back player is the server, with players assuming the serving position by rotating in a clockwise direction. A team only makes points when it serves and the serving team keeps the serve, with the same person serving, as long as it continues to score. The opponent, or receiving team, is awarded the opportunity to serve when the serving team fails to score. The serve must cross the net without touching the net or any of the serving team's players. The first team scoring 15 points, provided there is a two-point advantage, wins the game. Normally, a match consists of the best two out of three games or three out of five. Other basic rules are: after a ball is served all players on a team may play anywhere on their side of the net; a player may not touch the net or the floor on the opponent's side of the net, a blocker may reach over the top of the net but a spiker may not; the ball must be clearly hit and may not visibly come to rest on a player's body; the ball must be played by some part of the body above the waist; the ball may not strike the body twice in succession. (*Volleyball over view*, n.d.)

1.2 The Impact of new scoring system

The new scoring system has made the game more exiting, at least from a spectator standpoint. The new scoring system has decreased, on average, the duration of volleyball matches (which was the intent in the first place). In the 1999 World League, the average length of all matches played was 1h46 (with the average playing time being 1h30) while the

average length of games was 23 minutes. At the NTCC, the average length of all matches played on the Women's side (all matches were best of 5) was 1h38 (no data on actual playing time) with the average duration of games being 24 minutes. On the Men's side, best of 5 matches averaged 1h29 while games were 24 minutes long on average. But the decrease in length should be less significant for lower levels. Up to a point where bantam and midget teams might actually play longer with the rally-point system. The new scoring system has bridged the gap between the top teams and the teams below, at any given level. Now that most of the points are being scored from the serve receive phase, teams with a weaker defense will not be disadvantaged as much, therefore games will be closer. In the World League, the percentage of matches ending 3-0 has decreased from 48 % (between 1990 and 1998) to 34 % in 1999. Furthermore, the final score for 76 % of all games played (297) this past summer (in the World League) ranged between 25-18 and 26-24. *(Impact of the new rules- Volleyball Canada, n.d)*

1.3 Impact of Libero rule

The libero rule has not yet made a big difference on the total number of balls dug by a team or on the serve receives efficiencies. Furthermore, liberos do not seem to dig more balls than other players on the team (the real question might be: "Is the libero digging more balls than the player he/she replaced would have?"). This could be attributed to the fact that since this is a new position, most of the players playing it are not significantly better than the regular players (which might not be the case in 2 or 3 years). Although at this point coaches are using the libero almost exclusively in replacement of middle players, variations (and uncertainties) exist from team to team as to how to use the libero. The most common scenario has the libero replacing both middle players after they serve and staying in for 3 full rotations (2 ½ to be more precise). Some teams have done it for only 1 of the 2 middle players (Russian Junior National Team, for example). As a result, the libero only plays "half the match". Some teams have used the 1st scenario with the middle players returning to the back row once in a while throughout the game to increase back-row attack possibilities (Team Canada Men). And then some teams have chosen not to use the libero at all (Cuba Women, Mexico Junior Women, Yugoslavia Men…). It will be interesting to see how the use of the libero will develop domestically. Time will tell… *(Impact of the new rules- Volleyball Canada,* n.d)

1.4 Serving and serve receive

The first reaction from a lot of people was that serving was going to become less aggressive with the new scoring system because a missed serve is now a point for the opponent. Although an easy serve will probably result in a serve receive point by the opponent, it seems that serving HAS become less aggressive, in general (It is however a tendency that should fade away as teams become more familiar and more comfortable with the rally point game). Teams seem to "make sure" a lot more than they used to, especially if the score is close (2-point difference or less). With a 3-point lead or more, the risk taking grows dramatically. We should see an increase of time spent on serving in training, to improve consistency, accuracy and control, especially at the grass root level. Keep also in mind that since players are now only allowed one toss (as opposed to 2), this toss becomes more important (especially for spike servers) as does the training of it.

Because of the fact that teams can now score points from their serve receive phase, and given the percentages, most of the points are (and will be) scored from that phase. We will see an increase in the amount of time spent on training serve receive to attack and a decrease in time spent on training defense to attack. Keep in mind that now, to win a game, only a few points coming from the defensive phase are needed by a team, or at least a few more (2 to be precise) than the opposing team is going to score on theirs. *(Impact of the new rules-Volleyball Canada,* n.d)

1.5 Motor Fitness Variables

For every volleyball player, agility, speed of movement and explosive leg strength are the very important skills out of the different motor qualities. Power, the explosive aspect of strength, is the product of strength and speed of movement. Although absolute strength is an important component of performance, power is even more important for most of the activities like volleyball. The important components required of the volleyball players are strength, power, speed, endurance, flexibility, technique, coordination, recovery, mental preparation and diet. Hence, the scholar in his present study, decided to experiment the following motor behaviour after a due consideration and experimentation,

1. Agility
2. speed
3. leg explosive power

The physical and psychological benefits of resistance training are well established. Resistance training exercises have been shown to raise the level of protective high-density lipoprotein, to improve physical fitness, and to reduce blood pressure among hypertensive. Exercises also seem to have positive psychological effects, which have been partially attributed to biochemical changes such as increased levels of endorphins and nor epinephrine. There is promising evidence that strength training and other forms of exercise in older adults preserve the ability to maintain independent living status and reduce the risk of falling sick. Physical activity appears to relieve symptoms of depression, anxiety and improve mood status.

1.6 Psychological Variables

Sports can be a positive experience for a sportsperson. Many aspects of psychological growth can result from sports participation. They are as follows:

1. Improves health related quality of life.
2. Improves one's mood status.
3. Alleviates symptoms associated with mild depression.
4. Reduces anxiety.
5. Enhances self concept, self esteem, self efficacy and self confidence.
6. Offers opportunities to experience 'peak' moment.
7. Provides recreation and a change of pace.
8. Offers an opportunity for individuals to challenge themselves and strive for mastery.
9. Offers creative and aesthetic experiences.
10. Increasing recognition of physical activity as a therapeutic modality.

Alkhigani et. al (2015), considered one of the psychological variables which should be found for the volleyball players because the ball's speed during its circulation inside the

playground which required a big mental preparing of players. The skill self should be found with the volleyball players in the college because of its importance in achieving the victims which led the researchers to search. The achievement motivation which the male and female students should be enjoyed whether in their practical lessons or theoretical lessons and whether it was teaching or training should be given importance and focus. They recognized the psychological variables were very important like the mental alertness and the skill self and the achievement motivation so it was important for the volleyball players to know it in the college of physical fitness.

Taking into consideration of the previous studies, the researcher decided as important the following psychological variables:

1. Sports Competition Anxiety
2. Achievement Motivation
3. Self Confidence

1.7 Volleyball Skill Related variables

García-de-Alcaraz et.al (2015) had the aim of their study to analyze male volleyball players' technical-tactical performance profile of the spike (attack and counterattack) at various age groups and categories. The sample comprised 16,467 spike actions (8,890 attacks and 7,577 counterattacks) performed by 986 players in 299 sets from various categories (U-14, U-16, U-19, national senior, and international senior). A descriptive and correlational inter- and intragroup observational design was used. The variables studied were: category of competition, spike tempo, and spike performance. The results showed a significant increase in the use of fast-tempo attacks (first and second tempos) as well as a significant improvement in the performance of first tempo spikes (both attack and counterattack). An increase in the speed of the game by means of fast attacks is observed at higher age categories, which contributes to higher efficacy. This paper discusses various reasons for the evolution in the spike as well as the effects on the training process in different categories of competition in volleyball.

Silva et al. (2014) studied was to identify the volleyball skills that discriminate in favour of victory. Twenty-four games (n=24) from the Senior Men's Volleyball World Championship played in Italy in 2010 were chosen and analyzed with Data Volley software. The discriminating function was used to identify the discriminating variables, using a canonical structuring coefficient of |SC| >.30. The results suggest that service points, reception errors, and blocking errors were the discriminating variables that identify the final outcome of the match (victory/defeat). Moreover, successful service points were the major variable most likely associated with match success (victory). In this sense, increasing the effectiveness of service should be a top priority in coaching elite volleyball teams.

On the basis of the above studies, the scholar identified serving, receiving, volleying, setting , spiking, and blocking as the most desirable skills of any volleyball player who play in a very competitive tournaments and matches. Every player should possess all the skills or most of the skills. For the present study, the researcher selected the following volleyball playing skills:

1. Serving
2. Volleying and
3. Spiking

1.8 Statement of the Problem

The purpose of the study was to critically analyze and compare resistance training, mental training and combined training groups on selected motor, psychological and volleyball skill related variables among college men volleyball players of age groups between 19 and 24 years.

1.9 Delimitations

The following delimitations were applied to this study.

1. The study was confined only to 120 male volleyball players among the volleyball players of Velammal Engineering College in Chennai city.

2. The study was restricted to 30 players each for Resistance training group, mental training group, combined training group and the control Group.

3. The age of the subjects ranged between 19 and 24 years.
4. The following criterion motor variables were selected for this study under namely agility, speed and leg explosive power.

5. The following criterion psychological variables were selected for this study namely sports competition anxiety, achievement motivation and self confidence.

1.10 Limitations

The following limitations were considered while interpreting the results of the study.

1. The previous experience and exposure of the subjects to the resistance training or mental training used in this study which might have influenced while testing the variables was not considered.

2. The factors, food habits, rest period, life style and extracurricular activities were not controlled.

3. The atmospheric temperature, humidity and meteorological factors during testing were also not considered.

4. Though the subjects were motivated verbally, no attempt was made to differentiate the motivation level during the period of testing.

1.11 Hypotheses

It was hypothesized that

1. There would be a significant difference on the selected motor variables among the resistance training group, mental training group, combined training group and the control group.

2. There would be a significant difference on the selected psychological variables among the resistance training group, mental training group, combined training group and the control group.

3. There would be a significant difference on the selected volleyball skill related variables among the resistance training group, mental training group, combined training group and the control group.

1.12 Significance of the study

a. The findings of the study will add to the existing knowledge with regard to the selected variables among the participants of the study.

b. The results of the study might provide guidance to the participants the ways to improve their volleyball playing ability and meet the physical demands of the game.

c. The results of the study might provide guidance to the participants the ways to improve their volleyball playing ability and meet the mental abilities required for the game.

d. The finding of this study will add to the quantum of knowledge in the area of training methods for producing the best volleyball players.

e. This study will endow with the importance of psychological mettle necessary for the present day volleyball players.

f. A unique aspect of this work was that it included recommendations for the practical use of the research finding to the public at large

1.13 Definition of operational terms

1.13.1 Agility

Agility is also influenced by body balance, coordination, the position of the center of gravity, as well as running speed and skill. Agility can be improved with agility training drills

but also by improving the specific individual fitness elements of speed, balance, power and co-ordination. Agility is one of the main fitness components, important for success in many sports, such as in the team sports of football and hockey, and in individual sports of tennis and squash. A vote of the top sports requiring agility has the sports of soccer, basketball and tennis ranked highest. See also another list ranking sports in which agility is important. (*Agility*, n.d.)

1.13.2 Speed

Speed is a key component of a physical fitness definition because of its wide application to many human activities. It is the maximal velocity that can be reached by part or all of the body. The speed of a sprinter is greater than that of a distance runner, although the distance runner can sustain his speed much longer. In some sports, the body as a whole does not move fast, but a part of the body does. In baseball pitching, for example, the hand and ball accelerate to great speed while the body as a whole barely changes its location. (*Speed,* n.d.)

1.13.3 Leg explosive power

Simply put, explosive strength refers to an individual's ability to exert a maximal amount of force in the shortest possible time interval. n summary, explosive strength refers to the ability to exert a maximal amount of force in the shortest possible time interval.
Power (which results from explosive strength) can be represented as:

Power (P) = Force (F) x Velocity (V) (*Explosive power*, n.d.)

1.13.4 Sports competition anxiety

Competition can cause athletes to react both physically (somatic) and mentally (cognitive) in a manner which can negatively affect their performance abilities. Stress, arousal and anxiety are terms used to describe this condition. The major problem in competition is letting your mind work against you rather than for you. You must accept anxiety symptoms as part and parcel of the competition experience; only then will anxiety begin to facilitate your performance. (*Sports competition anxiety,* n.d.)

1.13.5 Achievement motivation

Achievement contexts can be found anywhere—on the playing field, on stage, in an art studio, or even in a kitchen or a garden. To be sure, standards and even the definitions of success vary among contexts. In sports success usually means winning, although it could also be defined in terms of personal improvement. Success for a pianist might be measured in the length of applause or in newspaper reviews, for a hostess in the amount of food the guests consume, and for a surgeon in patient survival rates. This article focuses primarily on school contexts, but most of the issues discussed apply to any context that involves some standard against which performance can be measured—any situation that offers the opportunity to succeed or fail. (*Achievement motivation,* n.d.)

1.13.6 Self confidence

Confidence results from the comparison an athlete makes between the goal and their ability. The athlete will have self-confidence if they believe they can achieve their goal. (Comes back to a quote of mine - "You only achieve what you believe").

When an athlete has self confidence they will tend to: persevere even when things are not going to plan, show enthusiasm, be positive in their approach and take their share of the responsibility in success and fail.

To improve their self confidence, an athlete can use mental imagery to:

- visualise previous good performance to remind them of the look and feel
- imagine various scenarios and how they will cope with them

Good goal setting (challenging yet realistic) can bring feelings of success. If athletes can see that they are achieving their short term goals and moving towards their long term goals then confidence grows.

Confidence is a positive state of mind and a belief that you can meet the challenge ahead - a feeling of being in control. It is not the situation that directly affects confidence; thoughts, assumptions and expectations can build or destroy confidence.

High self confidence

- Thoughts - positive thoughts of success
- Feelings - excited, anticipation, calm, elation, prepared
- Focus - on self, on the task
- Behaviour - give maximum effort and commitment, willing to take chances, positive reaction to setbacks, open to learning, take responsibility for outcomes

Low self confidence

- Thoughts - negative, defeat or failure, doubt
- Feelings - tense, dread, fear. not wanting to take part
- Focus - on others, on less relevant factors (coach, umpire, conditions)
- Behaviour - lack of effort, likely to give up, unwilling to take risks (rather play safe), blame others or conditions for outcome. (*Self confidence,* n.d.)

1.13.7 Volleyball serving skill

The volleyball techniques for serving are probably the easiest skills in volleyball to learn. When executing a serve, the player tosses the ball to themselves. Since a server has complete control over everything involved (the toss, getting in position, etc), these factors make the skill of serving a lot easier to learn than other volleyball skills.
The following are important cues for serving.

- Draw the arm back.
- Take a small step and toss.
- Hit the ball with the palm of the hand. (*Volleyball skills*, n.d.)

1.13.8 Volleyball volleying skill

Passing is a very important skill in volleyball because without a pass, a team can't run an offense. A passers main job is to communicate with teammates and get the ball to the setter.

The ball needs to be passed in such a way that makes it easy for the setter to set the ball. The better the pass, the better the set. The better the set, the easier it is for an attacker to spike the ball. The better the spike, the more likely the team will win the rally and score the point. Just like other basic skills in volleyball, it's important to learn proper volleyball techniques for passing. The following are tips for learning how to pass...

- Stand with the body weight on the balls of the feet. Be in an athletic position ready to move.
- Get the platform out early.
- This means the arms should be out and hands together ready to pass the ball.
- Angle the arms toward the target.
- Gentle shoulder shrug as you pass.
- For offline passing deep balls, drop the front shoulder while angling the platform towards the target. (*Volleyball skills*, n.d.)

1.13.9 Volleyball spiking skill

Perhaps the most fun of all the volleyball techniques is spiking. The volleyball approach and spike is one of the most beautiful athletic movements in all of sports. It's also a very important skill in volleyball. The better a team is at spiking, the more likely a team will have successful hits that result in winning rallies. Spiking is a lot of fun. However, of all the volleyball techniques, it's probably the most technical.

In order to be a good hitter, you need to practice and develop a consistent spiking technique. The following are tips for learning how to spike...

- First, recognize whether or not you need to help out with the pass or the set.
- Next, communicate with and watch your teammates pass. Watch the setter. Try to predict what is going to happen.
- Line up for your approach.
- Read the set coming.

- Start your approach. Use the correct footsteps (left-right-left for right handers)
- Plant from the appropriate spot to jump.
- While approaching, bring the arms back then forward and up as you jump. Jump off both feet.
- Bow and arrow the arms and hands.
- Have the hitting arm vertical when making contact with the ball.
- Focus on contacting the ball with the entire hand.
- Contact the ball with the hand in a claw-like fashion.
- The ball should have topspin after making contact. If the ball doesn't spin, then you didn't claw. (*Volleyball skills*, n.d.)

Chapter II

REVIEW OF RELATED LITERATURE

The related literature reviewed for better understanding of the problem and to interpret the results is presented in this chapter. The review collection was confined to the libraries of Dr. M.G.R. Educational and Research Institute University, Chennai, Tamil Nadu Physical Education and Sports University, Chennai and the Central Library of Velammal Engineering College, Chennai and the internet and web resources. The literature in any field forms the foundation upon which all future work will be built. If we fail to build upon the foundation of knowledge provided by the review of literature, the scholar might miss some work already done on the same topic. The reviews are classified under the following headings.

2.1 Studies on motor variables

Physical fitness is the total of various independent variables. Generally these variables are performance oriented and depend upon the functioning of different systems of the body. Different sports events demand a combination of different physical variables for high quality performance. There are certain physical fitness components, which are discussed at various levels in relation to the performance. Some of them are speed, endurance, strength, power, agility, flexibility, and coordination The physical performance factors are ones most influential parameters deciding the winner and loser. Among them certain factors that are basic to all performance and highly specialized movements are the result of training and experience, which are found in high caliber games and sports.

2.1.1. Agility

Agility is a necessary prerequisite for all physical exercises requiring the participation of the whole body and the interplay of all groups of muscles. Agility plays a significant role in the

training of technique. The aim in training skills is to bring the athlete closer to the ideal form of the sequences of the movement during the competitive period. In any physical activity or in a game situation, the controlled ability to stop, to start and to change direction rapidly and more quickly is a very essential factor and this quality decides one's performance level and the speed of acquiring any skill. The absence of that ability among the participants would spoil the original game score.

Mahalingam and Vairamani (2015a), in their extensive investigation had indicated the advantageous effect of physical activity on physical fitness and activities of daily living in older adults, but none had delved into the effects on the health of the women who had all along their life been helping everyone to enjoy life. This exploration studied the effect of an exercise program on Body Mass Index, Flexibility and Agility in women of age ranging from 40 to 50 years. Ninety (mean age 42.5 ± 5.5 years) women were randomly assigned to two treatment groups (n = 30) and a control group (n = 30) group and were evaluated before and after training. The treatment group completed an 8-week walking and guided yoga programs. Assessments included body weight and height, Boomerang Run Test (Right) for measuring agility and Sit and Reach Test for measuring Agility. ANCOVA revealed significant differences between groups ($p < .001$) for all measurements. Post-hoc test revealed that walking program had a higher effect in all the three fitness measures than yogic program.

Mahalingam and Vairamani (2015b), were of the opinion that school boys were under the influence of television, computer games and junk food and are not interested in any type of physical activity. Even during the games periods, they stayed under the shades of trees and just chat and play games through their mobile apps. It was a very dangerous situation that requires immediate attention. Before defining any program, the author tested the levels of agility and flexibility of 60 school boys of 9^{th} standard (Age 15 years) in a Chennai city school. Since agility was considered as an important movement skill necessary for successful participation in any kind of games that demand rapid change of direction and flexibility was needed to perform everyday activities with relative ease. It was astonishing to note that their levels of agility and flexibility were comparatively very low to their age and hence the scholar devised an aerobic exercise program and Suryanamaskar routine. He divided the 60 boys into

three groups as Experimental Group - I, Experimental Group – II and administered aerobic exercise program for Experimental Group I and conducted the suryanamaskar for Experimental Group – II, 6 weeks, five days in a week. The control group did not have any physical activity. After the experimental period of 6 weeks, the measurements on Agility and Flexibility were taken and the results were analyzed through the application of ANCOVA. It was found that the Experimental group I and Experimental Group-II had shown significant improvement in their levels of Agility and Flexibility and the Experimental Group – II which performed the Suryanamaskar Program showed better levels of improvement over the Experimental Group – I which performed the Aerobic Exercises. It was concluded that the passive Suryanamaskar if performed 12 times daily with breathing control as described, would definitely improve the general fitness and specifically the Agility and Flexibility. It was recommended that Yoga teachers might be appointed in schools and they teach Suryanamaskar along with their regular yoga program which will go a long way in maintaining the general fitness of school boys.

Ho et al. (2015), realized that the agility T-test and countermovement jump test had long been used to examine the agility of athletes. However, for some sports, newer systems of evaluation were being designed for specific movements. The goal of their study was to design a blocking agility system and apply it to analyzing the efficiency of 6 weeks of plyometric training on volleyball players. A total of 26 male volleyball players in Taiwan participated in the study. The participants were divided into a plyometric training group and a control group. The agility T-test, countermovement jump test, and blocking agility test were used to examine the influence of plyometric training on the blocking agility of volleyball players. A single-factor analysis of covariance was applied to obtain the variables for the two groups. There was no significant difference between the groups on the agility T-test. On the countermovement jump test and blocking agility test, the plyometric training group performed significantly better than the control group. Also, the power values of blocking agility were higher than 90%, which demonstrated very good validity. The results of this study indicate that appropriate plyometric training can increase the rate of force development for vertical jumps and significantly enhance the combined agility of volleyball players in terms of lateral-movement speed and quickness, which enable players to rapidly perform blocking actions.

Mishra and Das (2015), illustrated that the word 'Sport' came from the old French word called Desport which meant "Leisure", but this word had changed its connotation with the passing time. Now sports were no longer believed to be practiced only in leisure time. Today they were one of the major parameters to judge a country's development and growth and are fast becoming great career options for the future generations. The purpose of the study was to observe the Difference in Hand - Eye Co-Ordination, Accuracy, Agility Hand Explosive Strength, and Leg Explosive Strength between Female Basketball Players & Volleyball Players. A total of Twenty Two (22) Female subjects were selected for this study. Out of them 11 were from Basketball, 11 were from Volleyball. The ages of the subjects were 13-19 years old. Selected Fitness Components of the subjects were the criterion measure for the present study. Selected Fitness Components were: This included- leg Explosive Strength, Hand Explosive Strength, Hand Eye Coordination, Agility and Accuracy. The leg Explosive Strength was measured by Vertical jump. Hand Explosive Strength was measured by putting the Shot. Hand Eye Coordination was measured by Rebound Ball Test. Accuracy was measured by Accuracy test. Agility was measured by (4x10 mts.) Shuttle Run. In respect of Accuracy, Agility, Hand Explosive Strength, leg Explosive Strength, there were no significant difference Between Female Basketball and Volleyball Group. In respect of Hand – Eye coordination Female group of Basketball players were better than the volleyball players of Female group.

Shaikh (2015), meant that functional training was the action of training "function," a general term that meaning 'role or duty.' Functional training was the science of training the body to meet the specific demands of life and sports. The aim of this study was to find out the effect of functional training programe on speed and agility on college male handball players. Subject: Thirty college male handball players of Dr. Meghnad Saha College were randomly selected for final study. Method: A pre-test, mid-test and post-test groups design was used and measures were the following; 50 Yards Dash test and 4×10 Yards Shuttle Run used of agility. For experimental group were alternative 3 days per week functional training schedule used for 8 weeks, whereas the active control group did individual game practices. Statistics: In the present study, the Mean, SD, ANOVA, LSD post hoc test for data analysis. Result: The results

of this study after 8 weeks functional training period in the experimental group's speed and agility significantly improved. It was concluded that functional training were beneficial for increasing speed and agility on college male volleyball players.

2.1.2 Speed

Speed is directly or indirectly of high importance in all sports and games. In sports, speed ensures optimum motor actions. To maintain pace or tempo of an exercise during a competition is possible only with the requisite level of speed. A faster movement also ensures high quality or skill of movement execution, which finds expression in accuracy, precision, rhythm and consistency. Speed is one of the most important physical qualities required for successful performance in jumps, especially in horizontal jumping and in pole vaulting. The amount of speed required is slightly different in these events and is due to the difference in the application of mechanical principles in the take off. It is said that sprinters are born not made and it is certainly true that natural ability will always play a major role. However, the standard is high and the competition is so fierce at present that no sprinter can achieve real success without correct techniques and intensive training. It has been established that running speed can be improved through training. Essential for successful performance in many motor activities is speed. The requirement differs from situation to situation. Running speed is an athletic event and is also very important in numerous other sports activities.

Rodríguez-Ruiz et al. (2014), had the aim of their study to evaluate the normalized response speed (Vrn) of the knee musculature (flexor and extensor) in high competitive level volleyball players using tensiomyography (TMG) and to analyze the muscular response of the vastus medialis (VM), rectus femoris (RF), vastus lateralis (VL), and biceps femoris (BF) in accordance with the specific position they played in their teams. One hundred and sixty-six players (83 women and 83 men) were evaluated. They belonged to eight teams in the Spanish women's superleague and eight in the Spanish men's superleague. The use of Vrn allowed avoiding possible sample imbalances due to anatomical and functional differences and demands. We found differences between Vrn in each of the muscles responsible for extension (VM, RF, and VL) and flexion (BF) regardless of the sex. Normalized response speed differences seem to be larger in setters, liberos and outside players compared to middle

blockers and larger in males when compared to females. These results of Vrn might respond to the differences in the physical and technical demands of each specific position, showing an improved balance response of the knee extensor and flexor musculature in male professional volleyball players.

Díez Vega et al. (2015), asserted that the true effectiveness in volleyball was related to the ability to perform quick displacements and jumping-related techniques (1). The monitoring of the muscular response had been related to functional capacity of the knee flexor and extensor muscles in other population. It was of utmost importance to the study the muscular structures that enhance volleyball performance (2). The aim of this study was to analyze the responses of the normalized response speed and jumping-related techniques in a group of professional female volleyball players. A total of 16 professional female volleyball players were assessed (age: 20.32 ± 1.68; body weight: 67.75 ± 9.13; height: 178.26 ± 7.12; BMI: 21.41 ± 1.75) from two Spanish Superleague teams. Normalized response speed (Vrn) was measured using the Tensiomyography (TMG) on Vastus Medialis (VM), Rectus Femoris (RF), Vastus Lateralis (VL), Biceps Femoris (BF) and Semitendinous (ST) previous to the season and after 4 months of training and physical conditioning. Abalakov jump test including volleyball specific arm movement (BLQ) and three steps approach-attack jump (ATT) were also assessed using a contact platform. The Vrn resulted improved for all the muscles except VM in both limbs were Vrn was maintained, but only Vrn results shown significant improvements on VL (Right: $p \leq 0{,}001$; Left: $p \leq 0{,}05$) in both lower limbs and RF ($p \leq 0{,}05$) in right leg. Height reached after training was significantly greater in both jump test BLQ ($p \leq 0{,}05$) y ATT ($p \leq 0{,}001$). Height gains support that the training and physical conditioning (adaptation, hypertrophy, maximal strength and transfer) results in improved jumping-related techniques. TMG-related results also show that there are mechanical adaptations in VL that are related to the requirements of volleyball. Moreover, the results obtained on VM in females reinforce the important role of these muscles in the stabilization of the knee joint during jumping-related techniques. ST behavior should be studied further.

Kasabalis et al. (2005), aimed their present study to evaluate the anaerobic power of elite male volleyball players, using the Wingate Anaerobic Test to examine the relationship

between anaerobic power and jumping performance. Athletes (n = 56) and Nonathletes (n = 53) were divided into three age groups: Adults (18–25 yr.), Juniors (15–16 yr.), and Youth (10–11 yr.). Measurements of height, body mass, vertical jump and Wingate scores indicated higher values for athletes. The specific training effects of anaerobic power were more pronounced at the age of 10–11 years than for Non-athletes. A significant correlation coefficient between peak power and vertical jump was found for Athletes (r = .86) and for the total group (r = .82). These results indicated that vertical jump may predict the maximal anaerobic power and could be used by coaches as a practical and easy-to-apply field screening test for evaluation in volleyball training.

Smith, Roberts and Watson (1992), believed that volleyball had been described as an 'interval' sport with both anaerobic and aerobic components. At the higher skill levels, technical performance might be limited by physical characteristics as well as physical fitness, and performance characteristics such as speed and vertical jump. This investigation compared teams at the two uppermost levels of men's volleyball in Canada for differences in physical, physiological and performance characteristics. The subjects were members of the national (n= 15) and Universiade teams (n = 24). The parameters examined included percent body fat, maximal oxygen uptake (VO_2 max), anaerobic power, bench press, 20-m sprint time and vertical jumping ability. The only significant difference in physical characteristics between the two teams was in age. Despite similarities in standing and reach height, the national team players had significantly higher block (3.27 vs 3.21 m) and spike (3.43 vs 3.39 m) jumps. An evaluation of anaerobic power measures produced similar power outputs during a modified Wingate test, yet the national team members had higher scores ($P<0.05$) for spike and block jump differences as well as 20-m sprint time. The large aerobic component of elite volleyball play was supported by the high VO_2 max value recorded for the national team players (56.7 vs 50.3 ml kg^{-1} min^{-1}). The results suggest that either years of specific physical conditioning and playing or the selection of individuals for the national team who possess more desirable characteristics as a consequence of genetic endowment, plays a significant role in the preparation of international calibre volleyball players.

Dalrymple et al. (2010), studied to determine the effect of stretching on peak jump height during a series of vertical jumps, specifically focusing on a) static stretching (SS), b) dynamic stretching (DS) and c) no stretching (NS) performed immediately before a series of countermovement vertical jumps (CMJ). Twelve female collegiate volleyball players (mean ± SD; age 19.5 ± 1.1 yr; height 1.71 ± 0.06 m; mass 71.3 ± 8.54 kg) volunteered for this study. Data collection lasted a total of 3 weeks, and each subject performed all 3 stretching protocols, 1 session per week, with 1 week between sessions. The order of the stretching protocols was randomized for each subject. During each testing session, all subjects performed a 5-minute light jog as a warm-up, followed by 8 minutes of 1 of the stretching protocols. One minute after the completion of each protocol, 5 maximal CMJ were performed on a force platform, with each jump separated by 1 minute of passive recovery. Jump heights were calculated by integrating the vertical force trace. There were no significant differences between the SS, DS, and NS conditions for any of the jumps ($p > 0.05$). Despite the lack of significant effects for the group, there were notable individual responses to each of the warm-up conditions. Practitioners should be aware of the individual responses of their athletes to different types of warm-up protocols before athletic performance and the possible impact of prescribing or eliminating certain exercises.

2.1.3 Leg explosive power

Power, the explosive aspect of strength, is the product of strength and speed of movement. Although absolute strength is an important component of performance, power is even more important for most of the activities. The important components of the pole vault program are strength, power, speed, endurance, flexibility, technique, coordination, recovery, mental preparation and diet.

Drusch et al. (2015), were of the judgment that architectural and physical performance measurements were commonly implemented to identify various physical capacities in many populations. However, previous research had suggested architectural measures, notably in the leg extensors, were ineffective predictors of vertical jumping (VJ) performance. Given the functional relevance of rapid strength development on explosive dynamic tasks, further research was warranted examining, a) the presence of associations of maximal (e.g., peak

torque; PT) and, in particular, explosive (e.g., rate of torque development; RTD) strength-related characteristics with jumping performance in the leg extensors, and b) the extent to which PT and RTD either uniquely, or synergistically contribute to VJ performance. The purpose of this study was to examine the relationships between isometric maximal and explosive strength measures of the leg extensors and VJ peak power (PP) output in female youth volleyball athletes. Thirty (mean ±SD, range: age= 13.73±1.11, 12-17 years, height=162.53±6.39 cm, body mass=57.84±12.05 kg) female youth competitive volleyball players reported to the laboratory on two occasions, with the first visit being a familiarization session. The second visit involved experimental testing, in which participants performed two isometric maximal voluntary contractions of the leg extensors on a dynamometer at a leg angle of 60º, followed by three countermovement VJ trials. Subjects performed countermovement jumps, starting in a standing position and feet firmly on the ground. Following the descent to the midpoint position and without pause, the subjects exploded upward as hard and fast as possible. PT and RTD were calculated as the highest 500ms epoch and the slope of the rise in torque in the first 200ms from onset, respectively. Lower-body PP was assessed using a linear velocity transducer, which was attached to the posterior side of a belt that was securely fastened to the subjects' waistline. Pearson correlation (r) and stepwise linear regression analyses were performed to examine the relationships. Results indicated that both PT (r=0.7) and late RTD (r=0.62) were significantly correlated to PP ($p \leq 0.01$). However, linear regression analysis revealed that PT was the only variable entered into the stepwise regression model (R=0.71; R^2=0.50). These findings showed that while both maximal and explosive strength variables correlated with VJ performance, only PT was necessary to effectively predict PP output with no additional explained variance from RTD. Thus, training regimens aimed at development of high force production of the leg extensors may enhance PP production during explosive vertical jump tasks more so than enhancing early rapid force production.

Sattler et al. (2015), Vertical jump performance of professional male and female volleyball players: effects of playing position and competition level. J Strength Cond Res 29(6): 1486–1493, 2015—Vertical jump (VJ) performance is an important element for successful volleyball practice. The aims of the study were (a) to explore the overall VJ

performance of elite volleyball players of both sexes, (b) to explore the differences in VJ performance among different competition levels and different playing positions, and (c) to evaluate the sex-related differences in the role of the arm swing and 3-step approach with arm swing on the jump height. We assessed the VJ capacity in 253 volleyball players (113 males and 140 females) from Slovenian first and second Volleyball Division. The height of squat jump (SJ), countermovement jump, block jump, and attack jump was tested using an Optojump system. We observed significant differences ($p \leq 0.05$) in VJ height between different levels of play that were most pronounced in the SJ. Position-related differences in VJ performance were observed in male players between receivers and setters ($p \leq 0.05$), whereas in females, VJ performance across different playing positions seems equal. Finally, we found that male players significantly better use the arm swing during VJ than females ($p \leq 0.05$), whereas the use of eccentric part of the jump and approach before the spike to improve VJ performance seem to be equally mastered activity in both sexes. These results could assist coaches in the development of jumping performance in volleyball players. Furthermore, presented normative data for jump heights of elite male and female volleyball players could be useful in selection and profiling of young volleyball players.

Lu (2015), selected 10 volleyball young athletes and 10 badminton young athletes as the object of study, randomly dividing into control group and experimental group. The normal strength training was used in control group and plyometric training was used in experimental group. After eight weeks, the results show that firstly, plyometric training significantly improved the explosive effect of lower limbs for young athletes, especially on the indicators of vertical jump to touch and single vertical jump; secondly, plyometric training cannot significantly improve biggest strength of lower limbs for young athletes. It also indicates that the improvement of explosive power of lower limbs does not depend on the improvement of biggest strength of lower limbs for young athletes. The normal strength training is better than plyometric training for biggest strength training for young athletes. Therefore, we suggest that the plyometric training for young athletes should be gradual and limited load. There is a difference between young and adult athletes for the intensity and measurement of plyometric training that will not take adverse reactions in the body for young athletes.

Kumar and Anbalagan (2014), had a purpose to find out the influence of varied combinations of complex training on the explosive power of school volleyball players. To achieve these purpose 60 school volleyball players with an age group of 14-17 years were selected from boys Higher Secondary School, Coimbatore as subjects. They were randomly divided in to four equal groups of 15 subjects each and assigned to experimental group-I, experimental group-II, and experimental group – III and control group. The Experimental group:-I (n=15, RTPT group) performed resistance training followed by plyometric training, Experimental group:-II (n=15; PTET group) performed plyometric training followed endurance training the Experimental group:-III (n=15; RTET group) performed resistance training followed by endurance training (n=15; control group) did not practice any specific training. The training period was 12 weeks. All the subjects underwent test namely vertical jump. They were assessed before and after the training period of twelve weeks. The 't' ratio was used to find out the significant pre and post mean difference between the groups to analysis the data. The study revealed that the above said variables were significantly improved due to the influence of resistance training followed by plyometrics training.

2.2 Studies on psychological variables

Sport psychology as an emerging field of psychology, is viewed as an attempt to understand, describe and explain the behaviour of sports persons in athletic setting both in practice and in competition, with a view to enhance performance. During the early twentieth century, few farsighted individuals recognized the importance of psychological factors in sport and initiated sport psychology research.

Driskell, Copper and Moran (1994), illustrated that mental practice was the cognitive rehearsal of a task prior to performance. Although most researchers contend that mental practice is an effective means of enhancing performance, a clear consensus is precluded because (1) mental practice is often defined so loosely as to include almost any type of mental preparation and (2) empirical results are inconclusive. A meta-analysis of the literature on mental practice was conducted to determine the effect of mental practice on performance and to identify conditions under which mental practice is most effective. Results indicated that mental practice had a positive and significant effect on performance, and the effectiveness of

mental practice was moderated by the type of task, the retention interval between practice and performance, and the length or duration of the mental practice intervention.

Although sport psychology had not yet emerged as a distinct discipline, the pioneering work of these early sport psychologists have raised numerous issues and paved the way for much of our current work and research. In modern competitive sports, psychological preparation of a team is as important as teaching them different skills of a game using scientific methods. Nowadays, teams are prepared not only to play, but to win the competition, for coaches feel that good mental and psychological preparation for competition is a necessary component for success.

2.2.1 Sports Competition Anxiety

Anxiety plays an important role in athletic performance. Whether its effect is positive or negative depends on how an individual perceives the situation. Athletes with low anxiety level have been known to perform better in sprinting performance. A moderate level of anxiety is seen as less for the acquisition and performance of skills. The levels of anxiety either too high or too low tend to inhibit learning and performance in sprinting. Anxiety is a natural part of competition at any level. But in the case of young and immatured athletes, anxiety can have a harmful effect on performance. It is the challenge in sports participation, which produces anxiety. Anxiety may be a positive motivating force or it may interfere with successful performance in sports. Anxiety is likely to be greater in higher competitive sports than relatively in non-competitive sports, participants are expected to win and great demands are made upon them to succeed.

Shilpi, Singh and Kumar (2015), examined the mental skill and competitive anxiety level as well as their relationship in Indian athlete's performance during competition. The totals of thirty eight (38) athletes of International and National level were selected to measure the correlation between variables of Ottawa Mental Skills Assessment Tools (version 3) with one weak difference and the relationship between Competitive State Anxiety Inventory-2D and Ottawa Mental Skills Assessment Tools (version 3) with the help of Pearson's Correlation. The responses given by athletes on mental skills questionnaire in Hindi and English language, which assessed 48 questions based on foundation skills, psychosomatic

skills and cognitive skills. In other hand the responses of athletes on mental skills and competitive anxiety questionnaire in Hindi and English language assessed cognitive anxiety, somatic anxiety and self confidence. According to the results and finding of this study, it is recommended that coaches must use mental skills during training for their athlete's performance which helpful for the athlete's to facilitate the performance and reduce the anxiety level during competition and create a positive approach's for their goal attainment. This study revealed that Mental Skills are helpful to established positive approaches in athletes in relations to their performance. The statistical analysis uses define the Reliability of Ottawa Mental Skills Assessment Tool -3 skills and relationship between OMSAT-3 and CSAI-2D on Indian population. The Pearson's Correlation method used with Test-Retest on athletes which measures significant relationship between 3 skills of mental skill tool and Person's Product Moment Correlation also used on Indian athlete's performance which measures the significant relationship between mental skills and competitive anxiety.

The increase in the performance has been the basic need or what dreamed by all athletes to stand out in their respective sports. Athletes train hard to improve their skills and talents regardless of the time they take to do so. A few years ago, athletes only enroll themselves in a few sports in the school level as a routine. Now, athletes choose to compete in one of may be two types of sport. In certain cases, some athletes in secondary school focus on only one particular sport. Psychology is the newest science, what needs to be trained and taught to well known or understand. Psychology is the service which provides step-by-step process for training the positive mental skills and reducing anxiety that will improve capabilities using the convenience of individual's. Psychological skills or mental skills have been essential to organized interventions, typically in health and their supporting contexts, where in systematic training of psychological skills takes place.

Gaetano, Paloma and Gaetano (2015), tried to address and define whether the sport was stressful for young athletes. Anxiety and stress affecting both young people and adults , either team sports or individual although with different effects. What was the role of the coach in reading and management of emotional states of anxiety- based, knowing the causes of anxiety allows us to understand how coaches can help their young athletes and make it

bearable. The importance that the athlete learns to recognize and manage the anxiety to improve it to their advantage and finally, are some suggested tips to better manage anxiety competitive. Aim was to investigate on the phenomenon and establish some significant aspects and give relationships with the sport in physical education.

Saudagar (2015), compared the Sports Competition Anxiety between Volleyball and Soccer male players. The subjects for this study were (N=60) male were 30 each from Volleyball and Soccer male players and age ranged from 18 to 25 years were purposive selected from Bilaspur district (C.G.). For the Acquisition of Sports Competitive Anxiety questionnaire developed by Martin (1990) was used. The independent't' test was used to analyze data. Results indicated that there is no significant difference was found between Volleyball male players and Soccer male players in their Sports Competition Anxiety.

Gould, Greenleaf and Krane (2002), explained that anxiety was defined as feelings of nervousness and tension which caused by the environment or surrounding expectation that was related to 'arousal'. Those demands were usually so stressful and thus causing an imbalance between the demands and the athlete's ability to fulfill the expectation.

Jaakkola, Ntoumanis and Liukkonen (2015), made a study to investigate the relations among situational motivational climate, dispositional approach and avoidance achievement goals, perceived sport ability, and enjoyment in Finnish male junior ice hockey players. The sample comprised 265 junior B-level male players with a mean age of 17.03 years (SD = 0.63). Players filled questionnaires tapping their perceptions of coach motivational climate, achievement goals, perceived sport ability, and enjoyment. For the statistical analysis, players were divided into high and low perceived sport ability groups. Multigroup structural equation modeling (SEM) revealed an indirect path from task-involving motivational climate via task-approach goal to enjoyment. Additionally, SEM demonstrated four other direct associations, which existed in both perceived ability groups: from ego-involving motivational climate to ego-approach and ego-avoidance goals; from ego-approach goal to ego-avoidance goal; and from task-avoidance goal to ego-avoidance goal. Additionally, in the high perceived sport ability group, there was an association from task-involving motivational climate to enjoyment. The results of this study reveal that motivational climate emphasizing effort, personal

development and improvement, and achievement goal mastering tasks are significant elements of enjoyment in junior ice hockey.

Yadav (2015), felt that many athletes who performed well during training or practice could suffer from performance anxiety on game day. The purpose of the study was to find out the correlation between Anxiety and Mental skill among University male volleyball players. A total of 15 university Volleyball male players were selected as subjects from different colleges affiliated to Karnatak University, Dharwad St: Karnataka, The ages of players were between 20 to 25 years. All the subjects completed Ottawa and SCAT questionnaire for measuring their mental skill and competitive anxiety. Results: t' -test was employed to evaluate the SCAT questionnaire and Pearson correlations method was used to assess the correlation between anxiety and mental skill. The results showed that there was a significant correlation between mental skill and competitive anxiety in university volleyball male players ($p<0.05$). The present study findings showed that it was important that sportsmen were classified according to the type of sport & type of event in order to judge the differences between different games and to identify methods by which they can achieve high levels of performance in their sports. The psychological training needs to be provided by the coaches along with the physical training and under psychological training, it is imperative that players are trained how to face stressful situations occurring during the competitions.

Anderson (2015), described that in addition to the Group Environment Questionnaire (GEQ), Social Networking Analysis (SNA) has recently emerged as a promising research approach to measuring team cohesion. However, little to no research has simultaneously used both measures to compare and contrast their unique benefits. Thus, the present study sought to examine the relationship between SNA (friendship and efficacy) and the GEQ, as well as their relationships with team performance, anxiety, retention, and satisfaction. Players and coaches from four NCAA Division-I Women's Volleyball teams ($N = 49$) completed an online survey at preseason, midseason, and postseason. Findings indicated that the GEQ and SNA are likely measuring different constructs. While the GEQ was a better global measure of team cohesion, SNA was able to offer unique contributions in exploring how specific dyadic relationships among team members evolve over the course of the season and contribute to performance,

anxiety, retention, and satisfaction. Visual inspections of the SNA networks revealed that the team with fewer friendship connections was more successful in terms of team performance. In addition, SNA efficacy was associated with lower levels of competitive somatic anxiety. The GEQ subscales that focused on individual attractions to the group (ATG-T and ATG-S) and SNA friendship and efficacy were moderately related to later intentions of returning to the team the following season. Finally, lower levels of cohesion, as measured by both the GEQ and SNA, were associated with lower levels of satisfaction later in the season. The results of this study help to highlight the positive outcomes variables associated with team cohesion, while also further positioning SNA and the GEQ as important, yet unique, tools for athletic administrators and coaches to use to better understand the functioning, or lack thereof, of their teams. Acknowledgements of practical applications and recommendations for future research are provided.

Coetzee, Jooste and Mostert (2014), explained that currently, knowledge was limited about how high school rugby players experienced cognitive and somatic anxiety when playing competitive rugby. The first aim of the study was to determine if high school rugby players displayed significant differences in cognitive and somatic anxiety before and after an important rugby match. The second aim sought to determine to what extent the important rugby match alters the cognitive and somatic anxiety experienced by high school rugby players. In order to realize these aims, high school rugby players were compared to male adolescents who were not participating in any type of sport. A purposeful sample of 10 first team high school rugby players and 10 male adolescents not participating in any type of sport was drawn from a high school situated in the Gauteng Province of South Africa. Cognitive anxiety was measured through the administration of the State and Trait Anxiety subscales of the State-Trait Personality Inventory Form Y (STPI-Y) and the Sport Competition Anxiety Test (SCAT). Somatic anxiety was measured by investigating the salivary cortisol levels of the rugby players. A baseline measure, along with measures on the day of an important rugby match and one week after the important rugby match were taken. Statistical analysis within the group of rugby players revealed that significant differences occurred in the state anxiety and SCAT scores. No significant differences occurred within the cortisol measures. When the rugby players were compared to adolescents not participating in any type of sport, significant

differences were observed between the two groups on state anxiety and SCAT scores. No differences with regards to cortisol levels had occurred. It was concluded that the rugby players had experienced cognitive but not somatic anxiety.

Esfahani and Gheze Soflu (2010), made a study with a purpose to compare pre-competition anxiety and state anger between female and male volleyball players (university students). The statistical population consisted of all male and female volleyball players (n=214) who participated in Iran volleyball university matches. It must be noted that the questionnaires were distributed among whole statistical population either 30 minutes before competition started in the hall where competition was supposed to be held or at the time the athletes went to the hall to start the competition and finally 88 questionnaires were collected from male volleyball players and 82 questionnaires were collected from female ones. In this research, the CSAI-2R questionnaire was used to measure cognitive state anxiety, somatic state anxiety and self-confidence on a scale ranging from 1 = not at all to 4 = very much so in a competitive setting. The State-Trait Anger Expression Inventory (STAXI; Spielberger, 1991) was also used to provide a measure of the anger experience as an emotional state (state anger), the disposition towards anger as a personality trait (trait anger) and the expression of anger. K-S (P=0.05) was used to ascertain data normality. Descriptive statistics (mean, standard error), t test and Pearson coefficient were used to analyze the data (P=0.05). The results showed a significant difference in all pre-competition anxiety subscales: cognitive state anxiety (t=3.62), somatic state anxiety (t=4.76) and self-confidence (t=3.06) (P=0.05). Although there was no significant difference in trait anger (t=1.41, sig>0.05), there was a significant difference in state anger (t=2.15) and the expression of anger (3.67) (P=0.05). Key words: Pre-competition anxiety % State anger % Volleyball players % Students

2.2.2 Achievement Motivation

Pelletier et al. (1995), described the sport motivation scale (SMS); was developed to measure an athlete's motivation toward sport participation. However, the SMS did not measure the most autonomous form of extrinsic motivation, integrated regulation, which was inconsistent with self-determination theory upon which the instrument was based. Moreover, several studies had questioned the factorial validity of the SMS. Hence, the purpose of this

study was to develop a revised version of the SMS, including integrated regulation. In Stage 1, the factorial validity of the SMS was examined using confirmatory factor analysis (CFA) on data collected from 614 Australians (elite athletes and university students). In Stage 2, the scale was revised by including integrated regulation items and replacing problematic items through an iterative process using CFA for data collected from 557 Australian university students. Concurrent validity of the revised scale was examined by evaluating correlations with the dispositional flow scale-2 (DFS-2). The revision led to development of a six-factor 24-item scale (SMS-6) that indicated a more parsimonious and improved fitting model consistent with SDT. Correlations between the SMS-6 and DFS-2 factors support the concurrent validity of the revised scale. Conclusion: From statistical and theoretical viewpoints, the revised SMS-6 was preferable to the original SMS, except for the discriminant validity issue of identification regulation. Further examination of the instrument is necessary by cross-validating the findings from this study.

Vansteenkiste (2014), in the current study aimed to examine the antecedents and outcomes associated with the variability in competitive volleyball players' (N = 67; Mage = 19.45; SD = 5.13) situational achievement goal pursuit and its underlying autonomous and controlling reasons. Players were followed during six consecutive games and data were analyzed through multilevel modeling. Players' dominant contextual goal pursuit reported at the onset of the study related to their situational (i.e., game-specific) goal pursuit. Further, variation in gameto-game mastery-approach goal pursuit, as compared with the pursuit of other achievement goals, related to variation in prosocial behavior. Finally, autonomous reasons underlying situational mastery-approach goal pursuit related positively to games-specific prosocial behavior, enjoyment, and performance satisfaction. The discussion emphasized the necessity to study players' game-to-game motivational dynamics and the reasons underlying players' achievement goal pursuit.

Bester (2014), in his study examined how athletes were generally motivated as well as during practice and competitions. He identified two types of motivation, failure avoidance and the pursuit of success. Athletes (hockey, athletics and rugby) took part in the investigation. The results of the investigation revealed that: Failure avoidance is significantly more

prominent than the pursuit of success when it comes to sport in general and during training sessions. As far as competition is concerned, the pursuit of success as a motivational approach was significantly higher than the avoidance of failure. The avoidance of failure as a motivational approach was significantly higher for males compared to female athletes. Grade 10 athletes displayed significantly less failure avoidance than Grade 12 athletes. Athletes who participated in team sport showed a significantly higher level of failure avoidance as a motivational approach compared to individual athletes.

Vink, Raudsepp and Kais (2015), felt that there was limited understanding of how sport motivation is associated with deliberate practice in youth team sport athletes. Therefore, the aim of this study was to examine prospective associations between intrinsic motivation and individual deliberate practice in specializing team sport athletes. Estonian adolescent team sport athletes ($N = 163$; M_{age} – 13.6 years at the beginning of study) completed the Sport Motivation Scale and training diary across a 12-month period. Both individual deliberate practice and intrinsic motivation increased over the 1-year period. Greater baseline intrinsic motivation predicted subsequent individual deliberate practice and greater initial individual deliberate practice predicted greater subsequent intrinsic motivation. The bidirectional relationship between athletes intrinsic motivation and individual deliberate practice were replicated across both time lags. The findings have significant implications for the importance placed on intrinsic motivation as a means of increasing of individual deliberate practice as well being an important outcome variable in specializing team sport athletes.

2.2.3 Self confidence

Gist, Bavetta and Stevens (1990), contrasted goal setting and self-management training designs for their effectiveness in facilitating transfer of training to a novel task. Behavioral measures of performance were used to assess transfer in terms of skill generalization, skill repetition and overall performance level. Skill generalization was more limited among the goal-setting trainees as compared to the self-management trainees. While goal-setting trainees generalized fewer skills to the novel task context, these skills tended to be used more repeatedly. In contrast, self-management trainees exhibited higher rates of skill generalization

and higher overall performance levels on the transfer task, even after the effects of outcome goal level were controlled. Implications are discussed for future research on training transfer.

Bull (1991), elucidated that adherence to mental-skills training had received little empirical investigation despite the recent growth and development in applied sport psychology services. The present study was designed to identify personal and situational variables influencing adherence to a mental training program. Volunteer athletes (N=34) were given a 4-week educational program before being left to train on their own for an experimental period of 8 weeks. Subjects were randomly assigned to one of three treatment intervention conditions (control, written reminders, and group meetings) designed to influence adherence behavior. Results demonstrated the influence of self-motivation in predicting mental-training adherence, but the interventions had no significant effect. Adherence levels were generally low but variable between athletes. Interviews with the athletes indicated the need for individualization of training programs, and problems of time constraints were identified as being influential in the adherence process. Comparable athletes (N= 18) who chose not to volunteer for the mental training program were psychometrically tested and demonstrated lower sport motivation than the volunteer athletes but greater skill in concentration.

Shoenfelt and Griffith (2008), made a preseason mental skills program for serving was implemented for the 11 members of an intercollegiate volleyball team (M age = 20.0 yr.; SD= 1.1; years of intercollegiate volleyball experience M = 2.6; SD = 0.9). Key mental skills taught were relaxation, imagery, intentional focus, goal setting, behavioural modelling, and performance routine. A videotaped behavioural model articulated and demonstrated technical performance keys to effective serving. Players utilized a three-phase service routine to increase automaticity of performance and to incorporate key mental skills. End-of-season reported use of imagery was significantly correlated with Good Serve Percentage, as was reported use of a service routine. The mean Good Serve Percentage for the season was 49% (SD = 7); the team goal was 50%. Serve-specific self-efficacy significantly increased from the pertaining program to the end of the season. Results indicated that implementing the mental skills training program was associated with enhanced service performance.

2.3 Studies on volleyball skills

The study of Yiannis and Panagiotis (2005), compared the effectiveness of the five principal skills in men's Volleyball (serve, reception, attack, block and dig) between the Sydney 2000 and the Athens 2004 Olympic Games and examined to what extent the observed changes were connected with the implementation of the new rules in Volleyball. The findings revealed a universal tendency of the elite men's volleyball teams to enhance their defence by reducing their block and dig faults. On the contrary there was an increase of the reception faults as a result of the improvement of the service effectiveness. The above changes reflected the teams' shift of tactics to win more points from their own serve. This tactical development became more imperative after the introduction of the rally-point system, which reduced the number of points played per set, and hence the teams' opportunities of gaining the minimum two-point advantage in order to win the set. Nonetheless, the Athens gold-medallist team of Brazil showed, in addition to the above, remarkable reception effectiveness which led to an outstanding attack capability, thus re-establishing the attack as the most important skill in volleyball.

Ciccarone et al. (2008), concluded that volleyball was an open skill sport with predominant anaerobic lactic acid power. At higher skill levels, performance characteristics were mainly determined by speed and vertical jumping ability. The aim of this study was to compare anthropometric parameters and jumping ability in a group of elite male volleyball players in relation to technical skills required by player position. The study population included 36 elite male volleyball players (coming from the Italian First and Second Division Championships). Subjects were grouped by playing position on the court: setters (7); blockers (10); hitters (16); liberos (3). Assessment included anthropometric parameters such as height, weight, body mass index (weight in kg/height in m2), indirect calculation of body fat mass by means of the Katch method (%BFM), measurement of reach with one hand (R1) and two hands (R2); and indirect measurement of explosive strength by means of the Bosco method: squat jump, countermovement jump (CMJ), CMJ with arm swing (CMJas), and repeated jumps for 15 s (R15”); measurement of motor coordination and jumping ability by means of the Vertec test combined with specific offense (Vertec attack [VA]) and defense (Vertec block

[VB]) skills. Results. Significant differences were observed between player specialization and anthropometric parameters (height, weight, BMI, R1 and R2). Results of the Bosco (SJ, CMJ, CMJas) and Vertec tests (VA and VB) also differed significantly among the player groups. Functional assessment protocols that evaluate anthropometric characteristics and jumping ability by means of two different unrelated methods, confirming that the two measure different aspects of the same performance, provide more complete indications for selecting players, workload planning and monitoring of player development during training.

Thissen-Milder and Mayhew (1991), determined the accuracy of general and specific tests for identifying the players on freshmen (FR), junior varsity (JV), and varsity (VR) teams and the precision of tests to differentiate between starters and nonstarters at each level of play. Fifty high school volleyball players were tested during the first week of practice for six general and four specific motor performance tests. The specific tests included the overhead volley, forearm pass, wall spike, and self bump/set test. The general tests included height, weight, percent body fat, agility run, vertical jump, and two flexibility maneuvers. VR players were significantly better in vertical jump, agility, and all specific ball-handling tests than FR and VJ players. The combination of forearm pass, overhead volley, vertical jump, and weight correctly classified 68% of the players to their team level. The combination of bump-set, height, weight, and shoulder flexibility allowed correct classification of 78% of the starters and nonstarters. General and specific tests can successfully select and classify high school volleyball players.

Kountouris et al. (2015), compared the differences in effectiveness of the five volleyball skills (serve, reception, attack, block, and dig) between men and women in high-level tournament games played at the last four consecutive Olympics. Results showed that men's and women's volleyball games are completely differentiated by two outcome measures. The first one is the higher proportion of faulty serves performed by men which is essentially attributable to the 19 cm difference in net height, while the second one derives from the fact that men outperform women at the execution of the attack.

Gabbett and Georgieff (2006), developed a skill assessment for junior volleyball players and to evaluate the reliability, validity, and sensitivity of the test for detecting training-

induced improvements in skill. Thirty junior volleyball players (mean ± SD age, 15.5 ± 1.0 years) participated in this study. Subjects performed tests of spiking, setting, serving, and passing skills on 2 separate occasions to determine test–retest reliability of accuracy. Two expert coaches evaluated the players' technique and reevaluated it 1 month after the initial evaluation to determine the intra-tester reliability for technique measurements. A third expert coach determined the inter-tester reliability for technique measurements. The validity of the test to discriminate players of different playing abilities was evaluated by testing junior national, state, and novice volleyball players. Finally, each player participated in an 8-week skill-based training program. Accuracy measurements and intra-tester and inter-tester ratings of players' technique proved to be highly reproducible (intra-class correlation coefficient, r, .85 to .98, range of typical error of measurement 0.2% to 10.0%). A progressive improvement in skill was observed with increases in playing level, while training-induced improvements were present in all skill tasks. These results demonstrate that skill-based testing offers a reliable method of quantifying development and progress in junior volleyball players. In addition, the skill-testing battery was useful in successfully discriminating playing ability among junior volleyball players of varying levels, and it was sensitive to changes in skill with training. These findings demonstrate that skill-based testing is useful for monitoring the development of junior volleyball players. The reliability, validity and objectivity of the following the test were established by the authors of the study and it had been used to test the skill of spiking in volleyball in the present study.

Palao and Valadés (2012), studied with the purpose a) to provide reference values for the standing spike test for female volleyball players and b) to study whether the standing spike test is valid for assessing the theoretical differences between female volleyball players. The sample included 83 players from the first nine teams of the Spanish women's first volleyball division (52 Spanish players and 31 from other nationalities). The variables studied were the ball speed of the standing spike test, the age of the players, the player's role (outside hitter, opposite, middle-blocker, libero, or setter), height, and nationality of the players (Spanish or foreign). The results demonstrate the ranges for the standing spike among female performance volleyball players (70-82 km · h^{-1}). The differences regarding nationality, player role, height,

and age seem to indicate that the test is a valid instrument for monitoring the performance of female volleyball players.

Jayakumar and Vairamani (2015a), tried to find out the effect of Resistance Training, Aerobic Training and Combined Training on Leg Explosive Power, Anxiety and Volleyball Serving Skill among women Volleyball players. For this study, 60 College Volleyball players were randomly selected as subjects from Velammal Engineering College, Chennai, Tamil Nadu, India. The selected players were divided into three groups namely Experimental Group-I, Experimental Group-II, Experimental Group-III and Control Group. Experimental Group-I was given only Resistance Training (n=15). Experimental Group-II underwent only a set of aerobic exercises (n=15). Experimental Group-III was subjected to the Combined programme of Resistance Training and Aerobics Training (n=15). The Fourth Group, the Control Group was not allowed to undergo any rigorous training other than playing regular volleyball games (n=15). All the 60 players were measured for their Vertical Jump Ability using Seargents Jump Test in centimetres, the anxiety level through SCAT questionnaire and the Volleyball service Skill through an apt test. All the Experimental groups performed their programmes for 8 weeks and daily they played volleyball game with the control group. After the experimental period of 8 weeks, again all the 60 players were measured for their vertical jump ability, the anxiety level, and the service ability through the same methods as done in the beginning. By subjecting the collected data to statistical analysis, it was concluded that the Leg Explosive Power had been found significantly improved at 0.01 level of confidence with the Experimental Group-II and the Experimental Group-III. All the three Experimental Groups had a significant improvement in Anxiety levels. It was concluded that the Combined Training with Resistance and Aerobes would significantly improve their jumping ability and Volleyball Service Skill in Volleyball.

Jayakumar and Vairamani (2015b), had a purpose to investigate the effect of resistance training, motivational training and combined training on selected physical variables (Explosive Power), psychological variable (Achievement motivation) in their service ability among volleyball players. 60 male volleyball players of age between 18 and 23 years were randomly selected from the Velammal Engineering college, Surapet, Chennai, Tamilnadu

volleyball players among those who had represented the college in the open tournaments and those who expressed their willingness to participate in the current study. Three groups at random were formed, as Resistance Training Group (RTG) (n=20), Motivation Training Group (MTG)(n=20) and Combined Training Group (CTG)(n=20). RTG underwent selected volleyball specific resistance training for 6 weeks, MTG underwent motivation training and the CTG performed the resistance training and motivation training. The obtained Data were analyzed using ANCOVA. Based on the obtained results it was concluded that Combined Training Group (CTG) has the highest potential for improving the explosive power and volleyball serving ability. Resistance Training Group (RTG) contrary to the expectation added excellently enhanced the Achievement Motivation. Motivation Training has helped the players to achieve the necessary motor fitness and serving ability in general.

Chapter III

METHODS AND MATERIALS

This chapter illustrates the selection of subjects for the study, selection of variables for the experiment, selection of tests used for measuring the different variables, tester competency while assisting and collection of data for the study, reliability of instruments used for the data collection, reliability of data collected, orientation of the subjects about the experimental variables that they had to undergo, administration of tests, collection of post test data, experimental design employed in this study and statistical technique used for analyzing the data collected.

3.1 Selection of subjects

The present study was to compare and critically analyze the impact of resistance training, mental training and combined training on the selected motor fitness, psychological and volleyball playing skill related variables among men volleyball players of age between 19 and 24 years. To achieve this purpose, 120 male volleyball players were selected at random from among the players who had participated in some form of competitive volleyball representing Velammal engineering college, Chennai city who expressed their willingness to participate in the study. They were explained about their role in the study and they were requested to extend their best cooperation in making the purpose of the study meaningful and useful to other public at large. They were informed of the purpose of the study and that they had to be in the experiment for a period of 12 weeks and follow the guidelines of the scholar.

3.2 Selection of variables

The important components required of the volleyball players are strength, power, speed, endurance, flexibility, technique, coordination, recovery, mental preparation and diet. Hence, the scholar in his present study, decided to experiment the motor behaviour after a due consideration and experimentation.

The physical and psychological benefits of resistance training are well established. Resistance training exercises have been shown to raise the level of protective high-density lipoprotein, to improve physical fitness, and to reduce blood pressure among hypertensive. Exercises also seem to have positive psychological effects, which have been partially attributed to biochemical changes such as increased levels of endorphins and nor epinephrine. There is promising evidence that strength training and other forms of exercise in older adults preserve the ability to maintain independent living status and reduce the risk of falling sick. Physical activity appears to relieve symptoms of depression, anxiety and improve mood status.

The scholar identified serving, receiving, volleying, setting , spiking, and blocking as the most desirable skills of any volleyball player who play in a very competitive tournaments and matches. Every player should possess all the skills or most of the skills. For the present study, the researcher selected the three volleyball playing skills.

3.3 Dependent Variables

Motor Variables

1. Agility
2. Speed
3. Leg explosive power

Psychological Variables

1. Sports competition anxiety
2. Achievement motivation
3. Self confidence

Volleyball playing skills

1. Service skill
2. Volleying skill
3. Spiking skill

3.4 Independent Variables

3.4.1 Resistance training group

All the members of this group started each resistance training session with a warm-up and ended with a cool-down. This warm-up was beneficial to their body because it got

it ready. Once they felt their body was okay to start, then they started at that moment. After they had properly warmed their body up and gone through three rounds of the routine, they were asked to cool-down. The cool-down did just what it implied. After putting their body through the stress of resistance training, it needed to slowly relax. This was the purpose for the cool-down. (*Warm-up and cool-down*, n.d)

They were informed that their body needed to make a slow transition to a relaxed state and did some form of aerobic activity. This group consisted of 30 men volleyball players who performed a set of 7 resistance training exercises, three times daily for 45 minutes for 2 days (Mondays and Fridays) in a week under the supervision of the scholar in the school auditorium between 5 and 6 pm. The schedule is given below. The same group walked on sand track for 100 metres and ran back as fast as they can for 3 days (Tuesdays, Wednesdays and Thursdays) in a week. They were asked to take complete rest for two days. They also played volleyball with the other groups regularly. (*Creative Commons Exercise Images*, n.d)

3.4.1.1 Bench Press

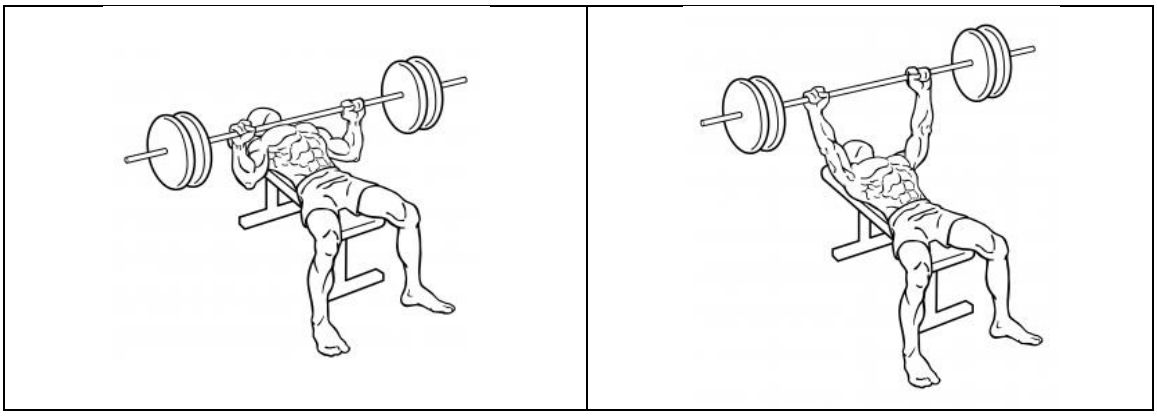

Fig: 3.1 Bench Press

Lie on a flat bench with your feet flat on the floor, keep your back flat on the bench. Grasp the bar a little wider than shoulder width apart. Raise the barbell above your body and move it over the middle of your chest, this is your starting position. Lower the bar down so it just touches your chest. Raise the bar till your arms are fully extended and your elbows are locked. Return to starting position

3.4.1.2 Seated Military Press

Sit on the bench with your toes pointing straight out, back straight and abs drawn in. Grip the bar with your palms facing outwards and your hands shoulder width apart With bar in front of your head, press upwards extending your arms but not locking them. Pause at the top and then in a controlled movement lower the bar to the starting position.

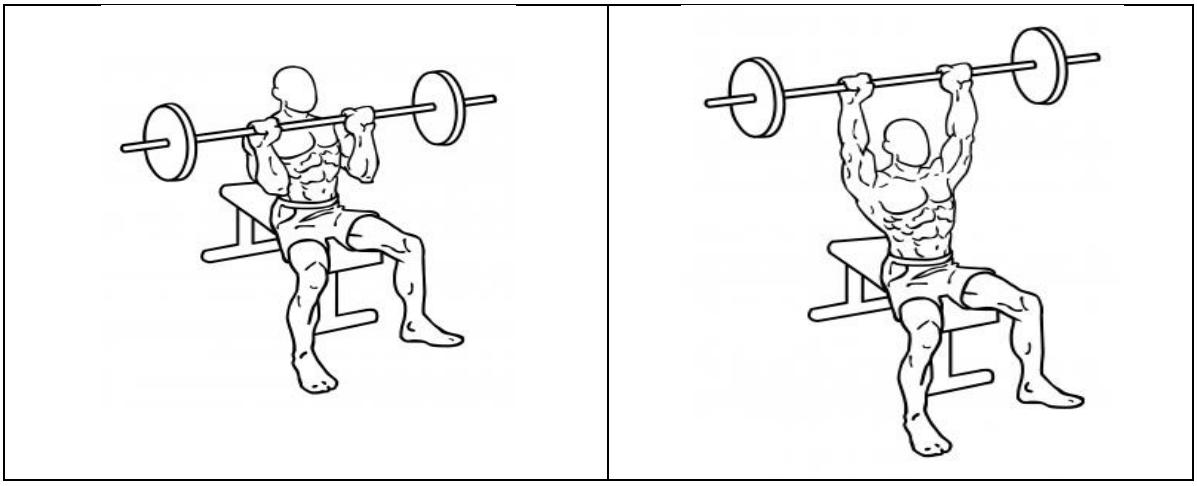

Fig: 3.2 Seated Military Press

3.4.1.3 Push ups

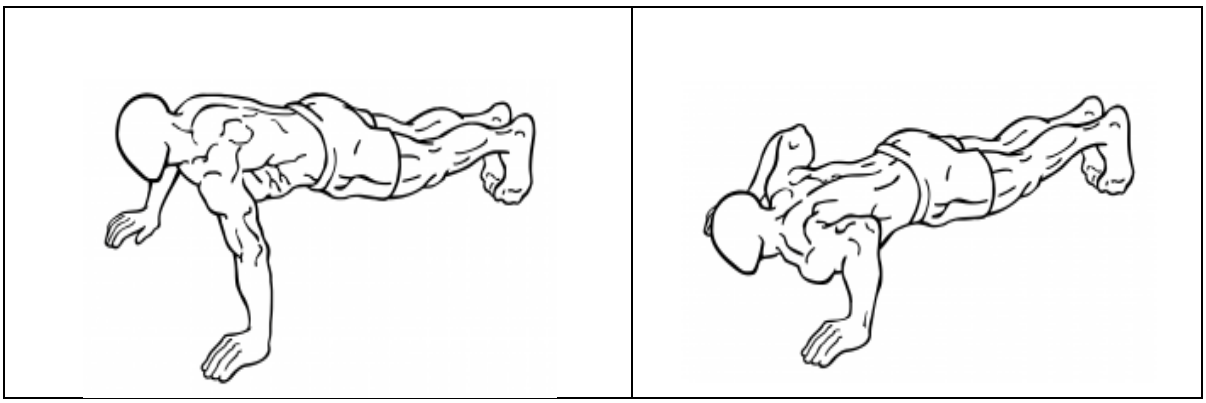

Fig: 3.3 Figure 2. Push Ups

Start with a basic push up, lay face down on the floor, or a mat; with your feet together curled slightly so you rise onto the ball of your feet. Place you hands shoulder width apart on the either side of your chest. Draw your abs in. Inhale as you raise your body up till your arms are straight. Keep your head and neck level with your body (don't look up or down) and don't allow your back to rise or fall. Exhale out as you lower your body back to the ground. Repeat.

3.4.1.4 Chin-ups

Grasp the bar with an supinated (overhand) grip. Let your body hang from the bar with your arms straight. Slowly pull yourself up so that your chin is higher than the bar. With a controlled movement lower yourself to the starting position.

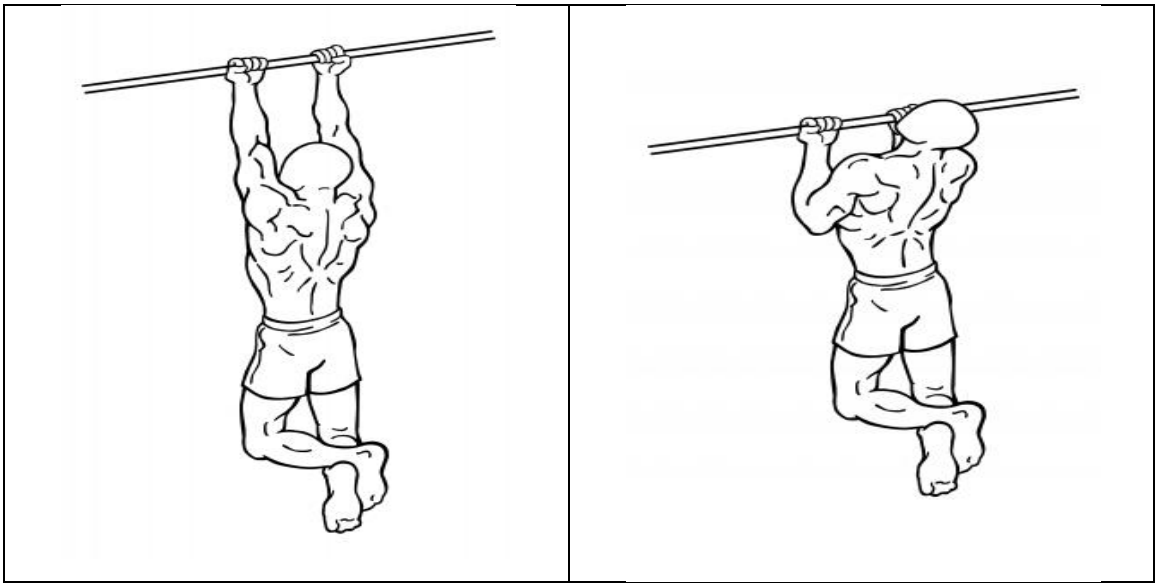

Fig: 3.4 Chin-ups

3.4.1.5 Barbell Front Raise and Pullover

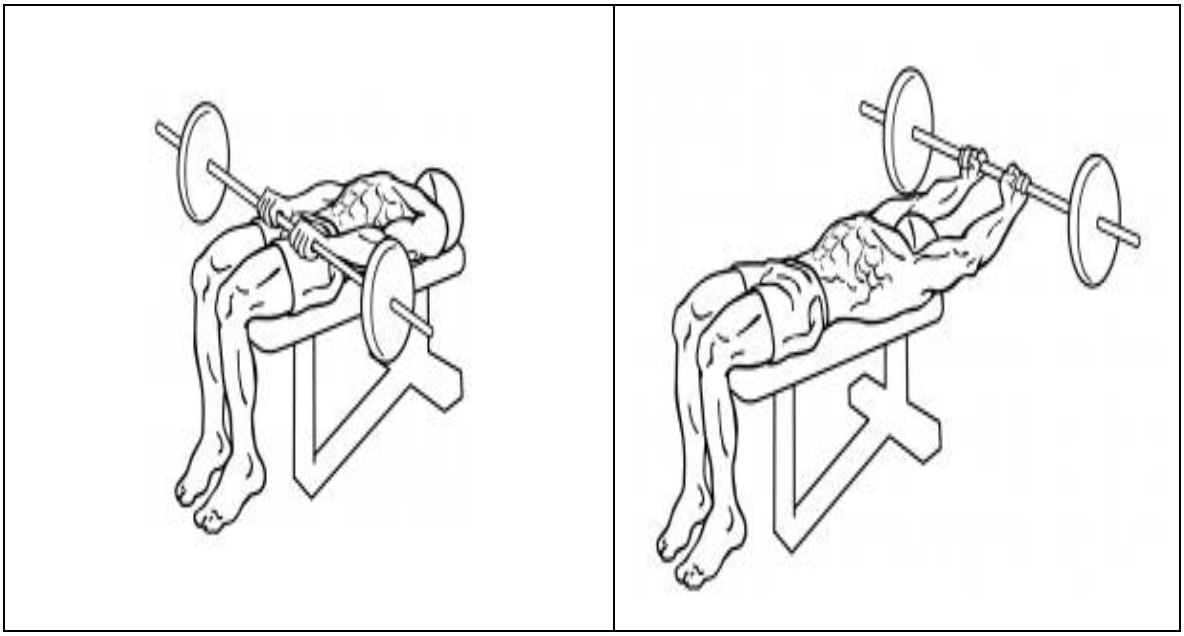

Fig: 3.5 Barbell Front Raise and Pullover

Lie on a flat bench and grasp a barbell using a medium grip (about 15" apart). Place the barbell on your upper thighs and lock your arms straight with a slight bend in your

elbows. Draw your abs in and keeping your back flat on the bench, raise your arms up in an arc over and behind your head (as if you were performing a reverse pullover). Slowly return the barbell to the starting position on your thighs.

3.4.1.6 Barbell Squat

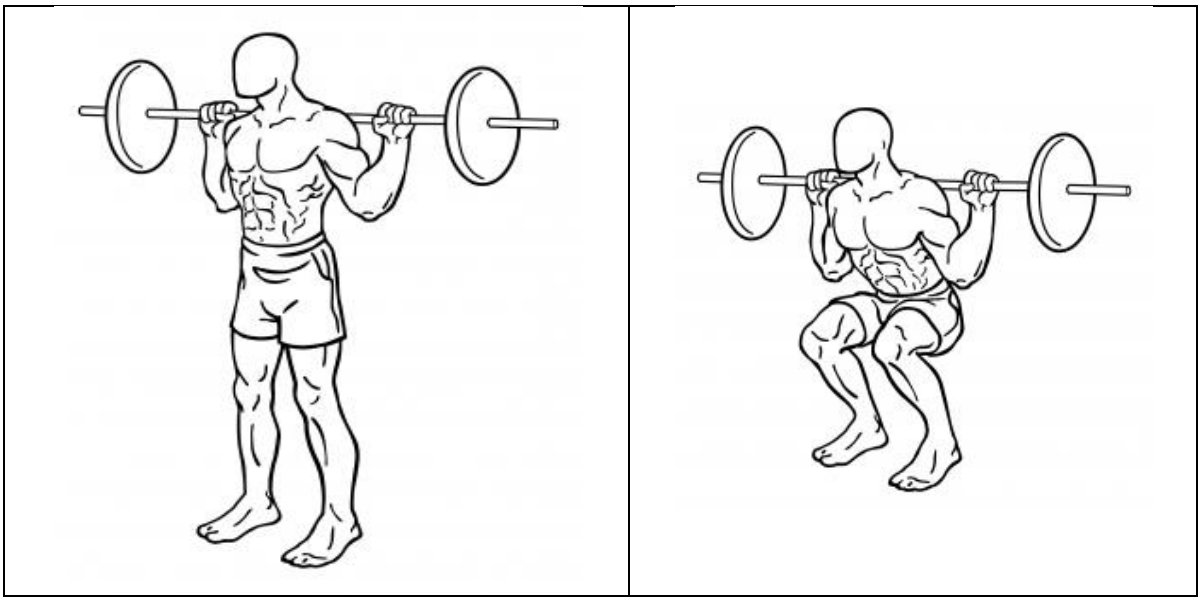

Fig: 3.6 Barbell Squat

Lifting a barbell off of a weight rack, position it on your shoulders. Place your feet slightly wider than shoulder width apart with your knees and toes pointed slightly outward. Drawing your abs in descend slowly by bending at the knees and hips as if you are sitting down (squatting). Lower yourself as far as you can control without letting your body shift towards your toes (this will cause you to lose balance). Pause in the downward position and slowly return upright to the starting position.

3.4.1.7 Flat bench leg raise

Lie on a flat bench with your hands under your hips supporting your back. Your legs should be unsupported by the bench from below your knees. With your feet together and your toes flexed upwards, raise your straight legs up a few cm off the bench; both of your legs should have no contact with the bench. This is your starting position. Keep your legs straight with a slight bend in the knees and raise your legs to just before 90 degrees with your hips. Pause at the top and lower your legs in slow controlled manner back to the starting position. Repeat

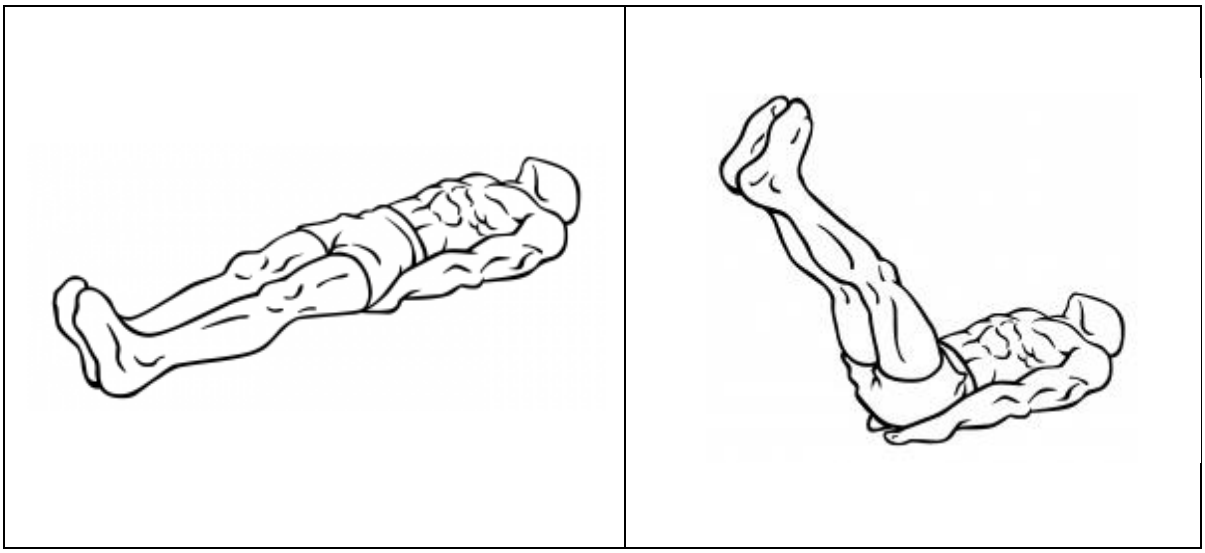

Fig: 3.7 Flat Bench Leg Raises

3.4.2 Mental training group

Sports psychology is a broad term used to describe the division of psychology related to the study of sport and exercise. Mental training is a more specific term used to describe the mental techniques necessary for consistent high performance. Mental training for athletes often includes goal setting, visualization, mental imagery, self-talk retraining, mind control training, emotion control and in general, ways to establish true ideal thoughts, images and emotions to enhance sports performance.

Performance anxiety is perhaps the most common problem experienced by athletes. The athlete feels anxiety as the competition is approaching, or during specific times during the competition, that produces mistakes and errors in judgment. Mental skills have been developed specifically for this condition. Calm, confident and carefree are words used by athletes to describe how it feels during periods of high performance. The 'zone' is the opposite of performance anxiety and can be controlled by any athlete who has the discipline to learn and practice mental skills. *(Mental training,* n.d.)

A brief list of the nine mental skills is discussed daily with the group members by the psychological counsellor and the coach. They were given the important nine qualities of the successful players and stressed to possess them. They are given below:

1. Choose and maintain a positive attitude.
2. Maintain a high level of self-motivation.
3. Set high, realistic goals.
4. Deal effectively with people.
5. Use positive self-talk.
6. Use positive mental imagery.
7. Manage anxiety effectively.
8. Manage their emotions effectively.
9. Maintain concentration.

Care was taken to train the group with the Mental Skills and to insist that these nine mental skills are necessary for performing well in sport as well as in non-sport performance situations. At the psychological training sessions,

- It was believed that these skills were learned and can be improved through instruction and practice.
- The work was begun with each individual by assessing his current proficiency in each of the skills.
- A plan was developed for teaching and enhancing the specific skills that needed improvement for the individual.
- The member's proficiency was periodically reassessed in each of the skills in order to evaluate the progress.

The group was taught about the Performance Pyramid daily. Although each of the nine skills is important, its primary importance will occur during one of three phases: long-term development, immediate preparation for performance, and during performance itself.

Level I - These mental skills constitute a broad base for attaining long-term goals, learning, and sustaining daily practice. They are needed on a day-by-day basis for long periods of time, often months and years.

Level II - These skills are used immediately before performance to prepare for performance. They may be used just before competition begins, or immediately before a specific performance action, such as a golf shot or a free throw in basketball.

Level III - These skills are used during actual performance behavior.

The pyramid below represents the relationship of the nine skills to one another. Each of the higher levels incorporates and is based upon the skills of the preceding levels.

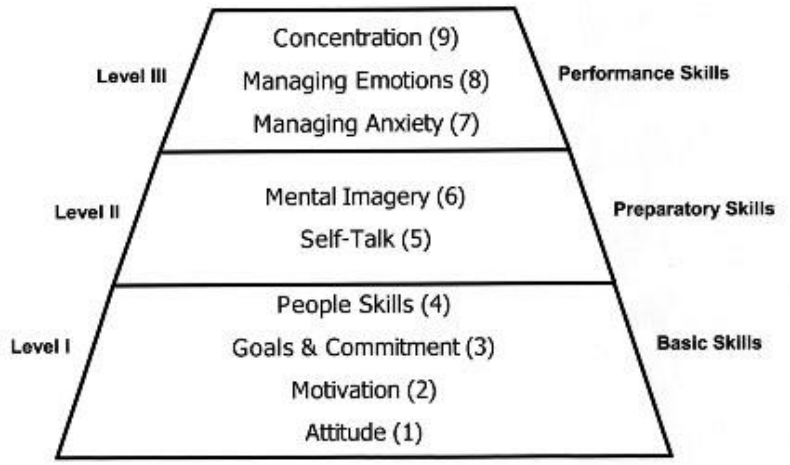

Fig: 3.8 Performance Pyramid

Out of all the nine components given under psychological skills, main concentration was given to the anxiety, motivation and self confidence since they were the variables under study. Also they were considered by the scholar that they decide the performance of the players.

To deal effectively with anxiety, it was time and again impressed up on the members of the experimental group that the qualities of the successful athletes would accept anxiety as part of sport, realize that some degree of anxiety can help them perform well and know how to reduce anxiety when it becomes too strong, without losing their intensity.

To deal effectively with motivation, it was impressed up on the experimental group that the successful players are aware of the rewards and benefits that they expect to experience through their sports participation, are able to persist through difficult tasks and difficult times, even when these rewards and benefits are not immediately forthcoming and realize that many of the benefits come from their participation, not the outcome.

To make an impact on self-confidence, te group was taught that the successful athletes maintain their self-confidence during difficult times with realistic, positive self-talk. talk to themselves the way they would talk to their own best friend, use self-talk to regulate thoughts and feelings and behaviors during competition. *(Mental skills, n.d.)*

Also, every day before the closure of the mental training session, video displays of best play offs in volleyball matches of national and international matches were shown to the members to give them the positive ideas of the competitions.

This programme of mental training was given for five days a week from Monday through Friday for 12 weeks. This group was involved in the daily practice sessions with the other groups as usual. No special training on volleyball was given to any of the groups.

3.4.3 Combined training group

The combined training group was having the following weekly schedule:

Monday:	Weight training for 1 hour with resistance training group
Tuesday:	Mental Training session with mental training group
Wednesday:	Sand running programme for 1 hour with the resistance training group
Thursday:	Mental Training session with mental training group
Friday:	Weight training for 1 hour with resistance training group

This schedule was followed for 12 weeks and the group also played volleyball wi the other groups regularly.

3.4.4 Control group

The control group with 30 members was instructed that they should not indulge in any type of organized physical training programmes or some other types of psychological counselling. But they were allowed to play usual volleyball practice sessions with the other group members.

From the available literature, the following standardized tests were selected and used to collect relevant data pertaining to the selected dependent variables and are presented in Table 3.1.

Table: 3.1 Selection of tests

S.No	Criterion Variables	Test items	Unit of Measurement
1	Agility	Boomerang Run (Right) test	Seconds
2	Speed	50 metres run	Seconds
3	Leg explosive power	Standing Broad Jump	Centimetres
4	Sports competition Anxiety test	SCAT Questionnaire	Score
5	Achievement motivation	Achievement motivation scale	Score
6	Self confidence	Self Confidence Questionnaire	Score
7	Volleyball service skill	Scott and Esther French's Service Placement Test	Score
8	Volleyball volleying skill	Brady's Wall volley test	Score
9	Volleyball spiking skill	Standing spike test	Score

3.5 Tester Competency

The investigator took all the measurements in this study with the assistance of his colleagues and experts working with the scholar. To ensure that the investigator was well versed with the technique of conducting tests, he had a number of practice sessions by using the correct testing procedure. The tester's reliability was established by test and re-test method.

3.6 Reliability of Instruments

The stopwatch and Standing Broad Jump Mattress with measurements marked on it were purchased from reliable and branded companies and are considered to be accurate enough. The Blood tests were made with the help of a famous and reliable laboratory for measuring, low density lipoprotein, high density lipoprotein and random blood sugar. The resting pulse rate was done by the scholar himself through the radial artery for 15 seconds and the data was multiplied by 4 for getting pulse rate per minute. The systolic blood pressure was measured by a qualified physician.

3.7 Reliability of Data

Test and retest method was used in order to establish the reliability of data by using ten subjects at random. The same personnel under similar conditions tested all the selected

dependent variables twice for all the subjects. The intra class co-efficient of correlation was used to find out the reliability of the data and the results are presented in Table.2.

Table: 3.2 Intra Class Co-Efficient Of Correlation On Selected Variables

S.No	Variables	Intra-class R Value
1	Agility	0.95*
2	Speed	0.96*
3	Leg explosive power	0.92*
4	Sports competition Anxiety test	0.97*
5	Achievement motivation	9.90*
6	Self confidence	0.95*
7	Volleyball service skill	0.96*
8	Volleyball volleying skill	0.93*
9	Volleyball spiking skill	0.90*

*Significant at 0.01 level of confidence.

Since the table value required for significance at 0.01 level of confidence was 0.77. Since the obtained 'R' values are higher than the required value, the data were accepted as reliable in terms of instrument, tester and the subjects.

3.8 Orientation of the subjects

The investigator explained the purpose of the study to the subjects and their role in the study. For the collection of data, the investigator explained the procedure of testing the selected dependent variables and gave instructions about the procedure to be adopted by them for measuring. The subjects of all the groups were sufficiently motivated to perform their maximum level during the testing periods.

3.9 Administration of Tests

Agility was measured using Boomerang Run (Right) test by marking with plastic cones as prescribed in the basketball mud court for all the subjects. The same procedure was performed once before the experiment and next after 10 weeks after the experiment

3.9.1 Boomerang Run Test

By using the Boomerang Run (Right) test , the Agility of all the members was measured and recorded in seconds. Participants ran in the direction indicated by arrows. The orange circles are the cones with the cone numbers showing the order of running from the center

station after completing right quarter turns, beginning from “Start” and finishing at “End.” (*Boomerang Run* n.d*).*

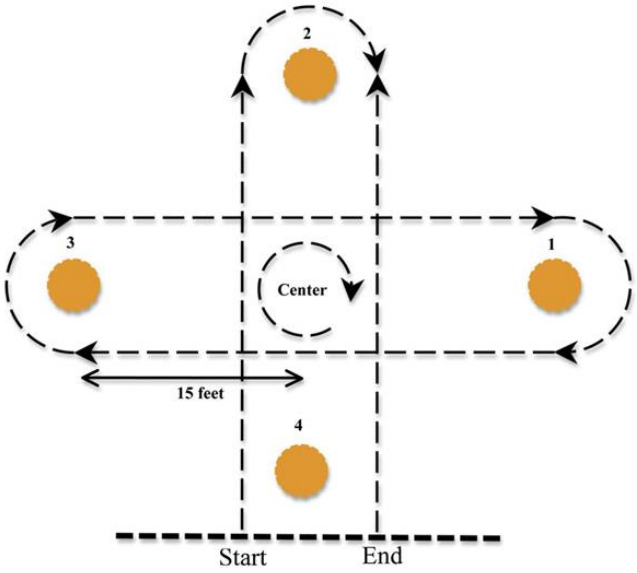

Fig: 3.9 Boomerang Run (Right)

3.9.2 Speed Test

50 Meter Dash

Sprint or speed tests could be performed over varying distances, depending on the factors being tested and the relevance to the sport. The 50 Meter Sprint was part of the International Physical Fitness Test, and their protocol was listed here.

- **purpose:** The aim of this test was to determine acceleration and speed.
- **equipment required:** measuring tape or marked track, stopwatch, cone markers, flat and clear surface of at least 70 meters.
- **procedure:** The test involved running a single maximum sprint over 50 meters, with the time recorded. A thorough warm up was given, including some practice starts and accelerations. The subjects started from a stationary standing position (hands cannot touch the ground), with one foot in front of the other. The front foot was behind the starting line. Once the subject was ready and motionless, the starter gave the instructions "set" then "go.". The tester provided hints for maximizing

speed (such as keeping low, driving hard with the arms and legs) and the participant was encouraged to not slow down before crossing the finish line. The time taken to cross 50 metres was recorded in seconds to the nearest 1 decimal place as the score of speed test. (*50 meter dash*, n,d.)

3.9.3 Standing Broad Jump

The leg explosive power was measured by using the marked standing broad jump mattress inside the school auditorium for all the 120 subjects. The same procedure was performed once before the experiment and next after 10 weeks after the experiment. (*Standing Broad Jump test* n.d).

The subject stood in one spot, and used her muscles to jump really far without any kind of lead-in. This test required concentration and focus. The distance jumped from the base line on the mat to the heel of the landing was measured as the performance. Three trials were given to the subjects and the best of the three trials were noted as the score of Leg Explosive power in centimeters.

Fig: 3.10 Standing Broad Jump

3.9.4 Sports competition anxiety test (SCAT)

Objective: To find out the amount of anxiety.

Equipment and Materials: Anxiety was assessed through the Sports Competition Anxiety Test questionnaire. (SCAT)

Procedure

Sports Competition Anxiety Test questionnaire (SCAT) prepared by Rainer Martens has been widely used for measuring anxiety related to sports situation in most of the advanced countries. The test was reliable and valid and designed to measure the degree of anxiety prior to the competition. The SCAT questionnaire was administered to all the subjects. Each subject was asked to answer all the 15 items of the tests and was instructed to express the choice most honestly. The SCAT has fifteen items out of which five are spurious questions, which have been added to the questionnaire to diminish biased responses. The subjects were instructed to respond to each item according to how they generally feel in competitive sports situations.

Every statement had three possible responses as mentioned below.

a. Hardly ever

b. Sometimes

c. Often

The ten test items, which were taken for scoring purpose, are 2, 3, 5, 6, 8, 9, 11, 12, 14 and 15. The remaining items were spurious items, which were not taken for scoring purpose are 1, 4, 7, 10 and 13. The scholar scrutinized the completed questionnaires in order to ensure that the subject had responded to every item and there was no question left unanswered. The items 2,3,5,8,9,12,14 and 15 were evaluated in a uniform manner using the following key.

Response Score

Hardly ever = 1

Sometimes = 2

Often = 3

In case of items 6,11 scoring was carried out using the following key.

Response Score

Often = 1

Sometimes = 2

Hardly ever = 3

However, spurious question i.e. 1, 4, 7, 10 and 13 were not scored out as suggested by Rainer Martens. Scores obtained by each subject on each statement was added up and that represented one's total score on sports competition anxiety. There was no right or wrong answers. The subjects were not allowed to spend too much time on any statement. The subjects were asked to choose the word that described the best opinion that they usually feel while participating in sports and games. (Johnson and Nelson 1982)

3.9.5 Achievement motivation test

To test the achievement motivation, a scale with 22 questions was given to all the subjects. They were asked to read each statement and answer True or False to indicate if that statement generally described them. Based on their responses, each subject was assessed about their motivation level. Lower the score they got, better their achievement motivation was. (Safrit and Wood 1995)

Interpretation*

22-20: High need for achievement.
19-17: Moderate need for achievement.
16-10: Average need for achievement.
9-6: Moderately low need for achievement.
< 5: Low need for achievement.

3.9.6 Self confidence test

Self confidence with Agnihotry's,1987, Self Confidence Inventory (ASCI) developed by Rekha Agnihotry was used to measure self confidence. The ASCI questionnaire was given to all the subjects to measure self confidence. All the items were adopted for this investigation. The inventory was scored by hand. One point was awarded for a response indicative of lack of self confidence, which is for making cross (X) to wrong response to item numbers 2,7,23,31,40,41,43,44,45,53,54,55 and for marking cross (X) to right response to the rest of the items. The lower the score, the higher would be the level of self confidence and vice versa. (Safrit and Wood 1995)

3.9.7 Volleyball service skill test

Scott and Esther French's service placement test was administered for the three groups.

Objective: To measure the serving ability with which a player could serve a ball against the target areas

Equipment and Methods: Three volleyballs. Net, measuring tape, chalk powder, scoring sheet and a standard volleyball court.

Directions: After a 10 minute warm up period, the subject was standing behind the end line in the service area with a volleyball and serve into the marked court over the net as shown in figure. The ball should be hit or bat over the net fulfilling the service rules. The foot fault and the ball served out of the target area were scored as zero.

Scoring: The score was in point value of the target area into which the ball was served. Each member was given three trials consisting of 10 services. The test score was the sum of scores of the best of the three trials served by each individual. (Scott and French 1959)

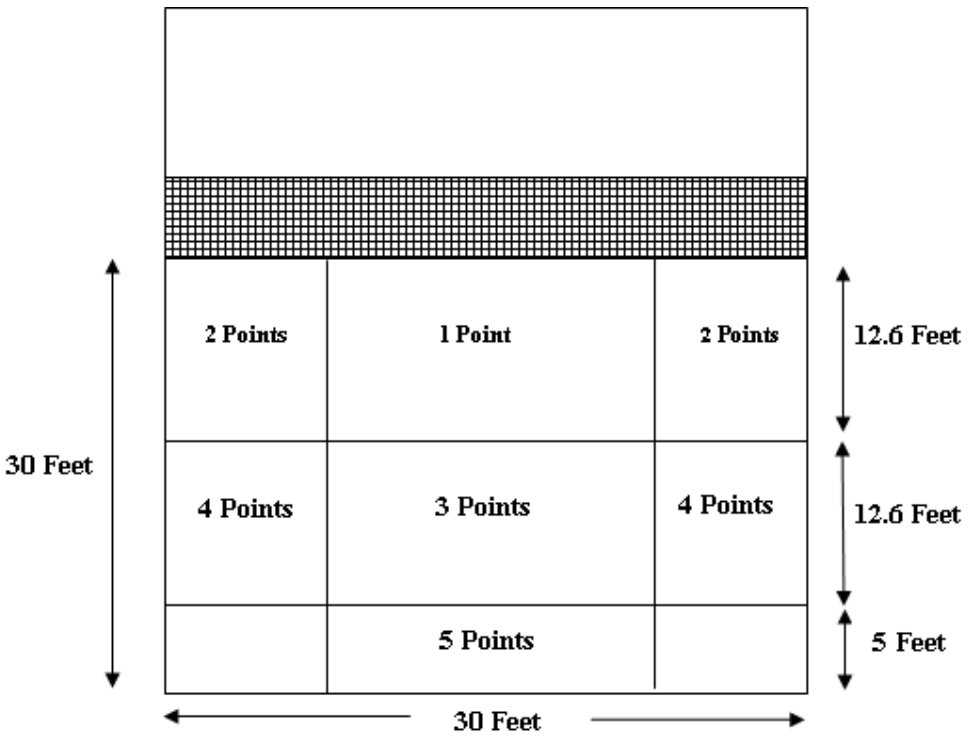

Fig: 3.11 Volleyball placement test

3.9.8 Volleyball volleying skill test

Brumbach forearm (underarm) pass wall volley test was used to measure the volleying skill.

Objective:

This test was to measure the ability and speed with which a player could volley (underarm) volleyball against a wall.

Equipment and materials:

A solid wall with a height of 1.5 to 3 metres height and a line with 1 inch thickness was marked parallel to the ground at a height of 2.44 meters (8 feet) above the floor level. A stop watch, scoring sheet, 3 volleyballs were required for the test.

Directions: The player with volleyball in hand stood ready facing the wall and on signal 'go', the ball was tossed against the wall into the area marked above 2.44 metres line. On the rebound, the ball was again volleyed by underarm into the wall above the line drawn at the height of 2.44 metres from the floor as shown in the figure.

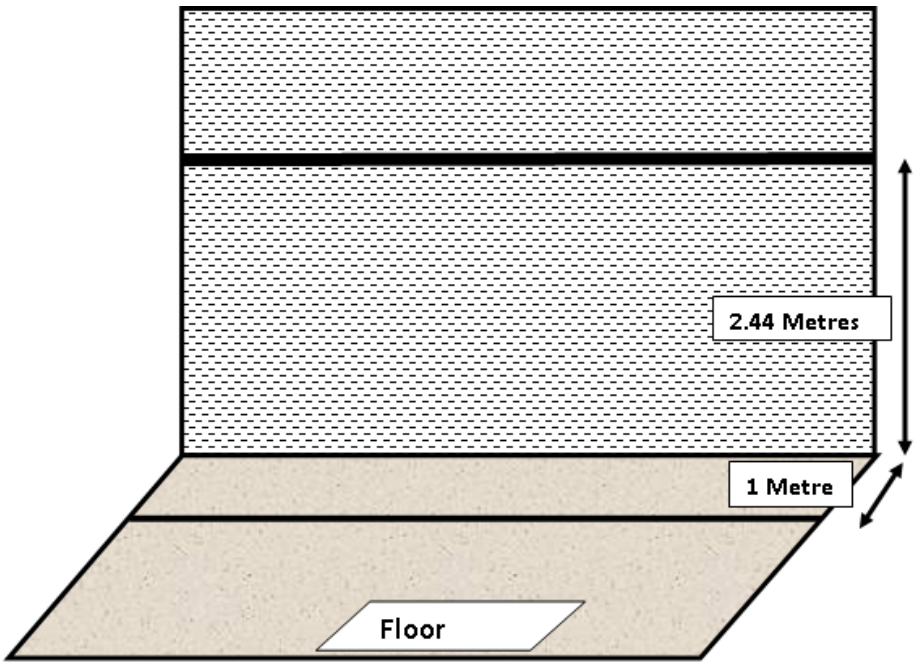

Fig: 3.12 Brumbach forearm (underarm) pass wall volley test

Scoring: The total number of legal volleys executed with in sixty seconds was recorded as the score. Each subject was allowed three trials and the best of the three trials were recorded as the score. With in 1 minute, if the rally is broken, the subject could collect the ball and start volleying. If the ball hits below the target line, then that was not counted as a legal volley. (Bosco and Gustafson, 1983).

3.9.9 Volleyball spiking skill test

Method: A target 2 m high and 1 m wide was placed on a wall 7 m from the player. The target was divided into five 20-cm segments. A coach positioned approximately 5 m from the spiking player threw an overhead pass to the player. Players were required to make a spike approach and spike (hit) the ball toward the target.

Scoring: If players were able to hit the middle 20-cm segment, they were awarded 5 points. For successfully hitting the two 20-cm segments on either side of the middle segment 3 points were awarded. Hitting the 2 outer 20-cm segments of the target they were awarded 1 point. If players successfully hit the target between the 3-point and 5-point segments Score 4 points were awarded. If players successfully hit the target between the 1-point and 3-point segments 2 points were awarded The aggregate from 6 trials was recorded as a player's accuracy score. (Gabbett and Georgieff, 2006)

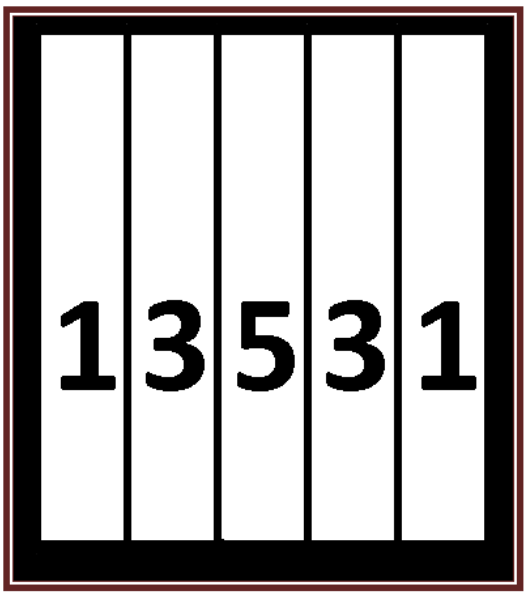

Fig: 3.13 Volleyball Spiking Test

3.10 Experimental Design and Statistical Technique

The data were collected from the Resistance training, Mental training, the Combined and the Control groups on selected motor, psychological and volleyball playing skills variables among men volleyball players of age groups between 19 and 24 years. The experimental design for the study was static group comparison design. Analysis of covariance ANCOVA (*Analysis of covariance* n.d) was used to find out the difference among the Resistance training, Mental training, the Combined and the Control groups on selected motor, psychological and volleyball playing skills variables. If the obtained F-ratio was significant, the Scheffe's test was used as a post-hoc test to find out the significant difference between each variable. In all the cases, 0.05 level of significance was used to test the hypotheses. (Clarke and Clarke 1972).

Chapter IV

RESULTS AND DISCUSSION

The statistical analysis, the findings, discussion on findings and interpretation of the results pertaining to the study are presented in this chapter. The purpose of the present study was to compare and analyze resistance training, mental training and combined training groups on selected motor fitness variables, psychological variables and volleyball playing skills among the men volleyball players of the Velammal Engineering College, Chennai. To achieve the purpose of the study, 120 men volleyball players in the age group of 20 to 25 years were selected randomly from the volleyball players of the college. The study was restricted to the following motor variables such as agility, speed and leg explosive power.

The following psychological variables considered to be important factor that decided the playing ability of the volleyball players such as, sports competition anxiety, achievement motivation and self confidence were chosen for the study. The main skills that play an important role in making the game of volleyball thrilling, interesting and enjoying like service skill, and volleying skill and spiking skill were selected among the other skills that decided the playing ability.

All the subjects were tested on the selected criterion variables before the commencement of the experimental treatment and recorded as initial scores. After the 12 weeks of the experimental treatment the subjects were tested on the criterion variables and the data thus collected were recorded as the final scores. The data pertaining to the variables in this study collected were examined by using Analysis of covariance (ANCOVA) for each variable separately in order to determine the differences if any, among the means. Whenever 'F' ratio was found to be significant, the Scheffe S test was used as post-hoc test to determine the cell mean differences. The level of significance was fixed at 0.05 level for all the cases.

The data thus collected before the experimental administration of the programmes were recorded as Pre Test scores. After the experimental period of 12 weeks, the

measurements were made and recorded as the post-test Scores. The eating habits, the profession and the economic and socio-cultural factors of the participants were not taken into account during the process of the statistical process. The collected data were subjected to ANCOVA and the results are presented below:

4.1 Motor Fitness Variables

To perform any activity that is competitive demands wide variety of motor fitness. The person with better motor fitness will excel any person who is idle and inactive. The important components that are required to play any specific game like volleyball in state , national and international level competitions are endurance, agility, speed, power and strength. How much they are required and how long they have to practice is still a matter of research.

In this study, the important motor fitness variables required to be developed are many but the scholar had selected only three major variables namely agility, speed and leg explosive power. The scholar was interested in finding out the level to which the experiment of resistance training, mental training and the combined training improve those variables. The researcher had given below the statistical analysis to find out the extent of improvement in the following analysis.

4.1.1 Data analysis for Agility

Ekinci, and Bajorek, (2015) stressed that Volleyball was a game of explosive strength, agility, skill and concentration. The game relied highly on the anaerobic energy system though aerobic endurance is important for recovery between points, stamina and tolerance to heat. Volleyball was a fast playing game. So it required to be fast. Players cannot hold the ball and cannot stop the ball. They had to make quick touch without stopping it. The speed of the ball could be 30 m in a second. Players had to make fast movements to do blocking and defence. So volleyball required agility.

The initial, final and ordered adjusted means of agility are presented in table 4.1. The obtained means of the dependant variable agility were found to have increased from their initial means when compared with the control group. The initial and final means of resistance training group were found to be 23.3 and 21.8 seconds. The initial and final means of mental training group were found to be 23.5 and 22.5 seconds. The initial and final means of combined training group were found to be 23.4 and 21.5 seconds. The initial

and final means of control group were found to be 23.4 and 23.4 seconds. The differences between the initial and final means of the three groups except the control groups had improved in their performance in agility.

Table: 4.1 Initial, Final and Ordered adjusted means of Agility

Groups	Resistance Training Group	Mental Training Group	Combined Training Group	Control Group
Initial Means	23.3	23.5	23.4	23.4
Final Means	21.8	22.5	21.5	23.4
Adjusted Means	21.9	22.4	21.5	23.4

ANCOVA was applied on the performance of resistance training group, mental training group, the combined training group and the control group for ascertaining that the differences among the means of agility among the four groups were not by chance and only due to the intervention of the experimental treatment. The ordered adjusted means of agility were subjected to the statistical treatment.

Table 4.2 displayed the ANCOVA summary of agility containing the ordered adjusted means and F-ratio. The agility was significant at $p<0.01$ level of confidence with an F- ratio of 7.44 which explained that the mean differences were not occurred due to chance but the differences were only due to the impact of the experimental treatment on the groups. By entering the F table with 3 and 115 df to determine the F ratios required for significance; these ratios were 3.16 and 5.01 at the $p<0.05$ and $p<0.01$ levels, respectively. Thus,

Table: 4.2 ANCOVA Summary for Agility

Source	SS	df	MS	F	P
Adjusted means	63.03	3	21.01	7.44	0
Adjusted error	324.7	115	2.82		
Adjusted total	387.73	118			

the differences among the four final adjusted means were significant well beyond the .05 level, since the F ratio obtained was 7.44. The value of covariance becomes apparent that the experimental treatment had good impact on the groups on agility. The final adjustment

means have not been determined as the analysis of covariance was calculated from the adjusted sum of squares. Since the F ratio is significant, the process should continue.

Since the value of F-ratio was greater than the table value, it indicated that there was a significant difference among the means of resistance group, mental training group, combined trained group and the control group on agility. To find out which of the three paired means had a significant difference, the Scheffe S post-hoc test was applied and the results are presented in table 4.3

Table: 4.3 Ordered adjusted Agility means of Combined training, Resistance Training, Mental Training and Control Groups

Combined Training Group	Resistance Training Group	Mental Training Group	Control Group	Mean Difference	F-Ratio
21.49			23.42	1.9	23.65
	21.87		23.42	1.5	15.30
		22.42	23.42	1.0	6.41

Table 4.3 showed the differences between adjusted agility means of control group had significantly lower mean than the means of combined group and resistance training group at $p<0.01$ level while applying Scheffe S post-hoc test with F-ratio of 23.65 and 15.30. The difference between the means of and mental training group and control group was significant at $p<0.05$ levels with F- ratio of 6.41. It was inferred that the combined group had improved the agility level than the resistance training group and the mental training group. On the basis of the data provided in Table 4.1, the graphical representation for better understanding of the variables had been provided. The agility had been improved better by the combined training group, resistance training group and the mental training group. These mean differences had been established using the statistical techniques. The improvement in the means was not just by chance but only due to the experimental treatments the groups underwent.

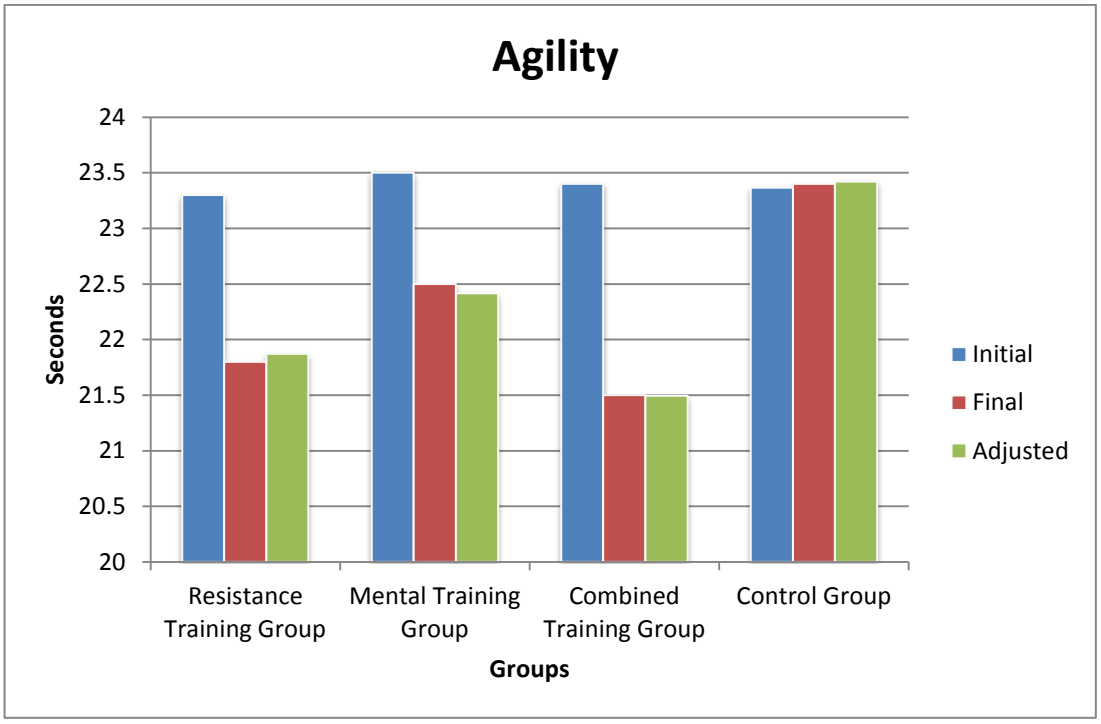

Fig: 4.1 Comparison of means of Agility

4.1.2 Data analysis for Speed

Mannan and Johnson (2015), made a study to improve the speed, power and agility of male volleyball players through volleyball specific plyometric training. To achieve the purpose, 30 male volleyball players were selected randomly from Telangana State Social Welfare Residential Junior College, Armoor, Nizamabad, Telangana. The selected subjects were assigned into 2 groups: control group (n=15) and plyometric training group (n=15). The selected subjects were tested before and after twelve weeks of plyometric training on speed, power and agility. The results of the study showed significant improvement on speed, power and agility ($p < 0.05$). It is concluded that twelve weeks of volleyball specific plyometric training showed improvement of 2.49% in speed, 13.51% on power and 1.93% in agility. This training clearly shows that vertical jump performance show greater improvement than speed and agility. This would significantly improve their spiking and blocking ability by jumping higher and ability to moves quickly in all direction while playing volleyball.

The initial, final and ordered adjusted means of speed are presented in table 4.4. The obtained means of the dependant variable speed were found to have increased from their initial means when compared with the control group. The initial and final means of

resistance training group were found to be 8.3 and 7.8 seconds. The initial and final means of mental training group were found to be 8.3 and 8.0 seconds. The initial and final means of combined training group were found to be 8.3 and 7.6 seconds. The initial and final means of control group were found to be 8.3 and 8.3 seconds. The differences between the initial and final means of the three groups except the control groups had improved in their performance in speed.

Table: 4.4 Initial, Final and Ordered adjusted means of Speed

Groups	Resistance Training Group	Mental Training Group	Combined Training Group	Control Group
Initial Means	8.3	8.3	8.3	8.3
Final Means	7.8	8.0	7.6	8.3
Adjusted Means	7.8	8.0	7.6	8.3

ANCOVA was applied on the performance of resistance training group, mental training group, the combined training group and the control group for ascertaining that the differences among the means of speed among the four groups were not by chance and only due to the intervention of the experimental treatment. The ordered adjusted means of speed were subjected to the statistical treatment.

Table 4.5 displayed the ANCOVA summary of speed containing the ordered adjusted means and F-ratio. The speed was significant at $p<0.01$ level of confidence with an F- ratio of 10.04 which explained that the mean differences were not occurred due to chance but the differences were only due to the impact of the experimental treatment on the groups. By entering the F table with 3 and 115 df to determine the F ratios required for significance; these ratios were 3.16 and 5.01 at the $p<0.05$ and $p<0.01$levels, respectively. Thus,

Table: 4.5 ANCOVA Summary for Speed

Source	SS	df	MS	F	P
Adjusted means	8.42	3	2.81	10.04	0
Adjusted error	32.12	115	0.28		
Adjusted total	40.53	118			

the differences among the four final adjusted means were significant well beyond the $p<0.05$ level, since the F ratio obtained was 10.04. The value of covariance becomes apparent that the experimental treatment had good impact on the groups on speed. The final adjustment means have not been determined as the analysis of covariance was calculated from the adjusted sum of squares. Since the F ratio is significant, the process should continue.

Since the value of F-ratio was greater than the table value, it indicated that there was a significant difference among the means of resistance group, mental training group, combined trained group and the control group on speed. To find out which of the three paired means had a significant difference, the Scheffe S post-hoc test was applied and the results are presented in table 4.6

Table: 4.6 Ordered adjusted Speed means of Combined training, Resistance Training, Mental Training and Control Groups

Combined Training Group	Resistance Training Group	Mental Training Group	Control Group	Mean Difference	F-Ratio
7.6			8.3	0.7	23.78
	7.8		8.3	0.5	15.77
		8.0	8.3	0.4	8.05

Table 4.6 showed the differences between adjusted speed means of control group had significantly lower mean than the means of combined group and resistance training group at $p<0.01$ level while applying Scheffe S post-hoc test with F-ratio of 23.78 and 15.77. The difference between the means of and mental training group and control group was not significant at $p<0.05$ levels with F- ratio of 8.05. It was inferred that the combined group had improved the speed level than the resistance training group and the mental training group. On the basis of the data provided in Table 4.4, the graphical representation for better understanding of the variables had been provided. The speed had been improved better by the combined training group, resistance training group and the mental training group. These mean differences had been established using the statistical techniques. The improvement in the means was not just by chance but only due to the experimental treatments the groups underwent.

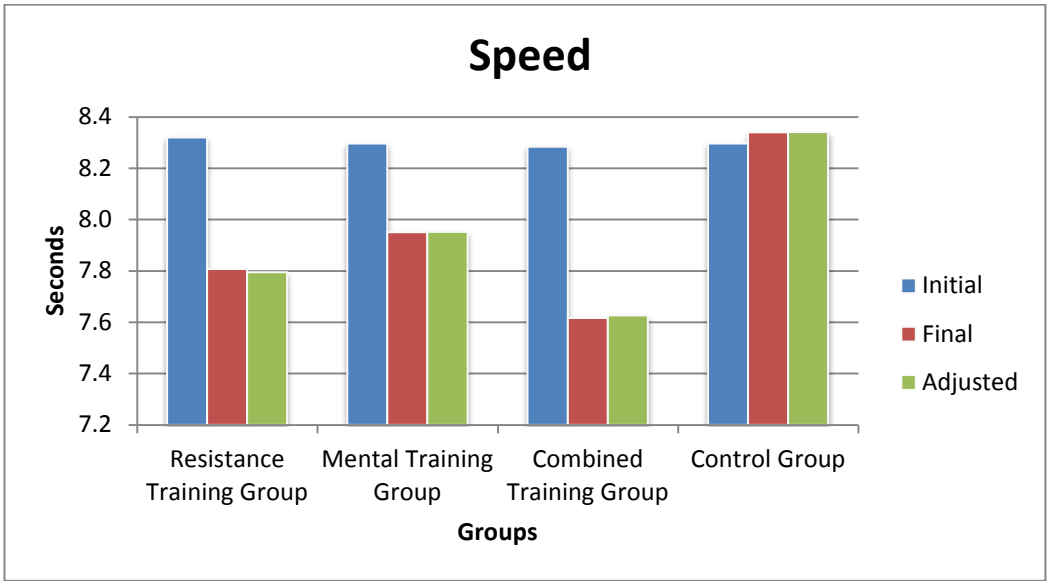

Fig: 4.2. Comparison of means of Speed

4.1.3 Data analysis for Leg explosive power

The initial, final and ordered adjusted means of leg explosive power are presented in table 4.7. The obtained means of the dependant variable leg explosive power were found to have increased from their initial means when compared with the control group. The initial and final means of resistance training group were found to be 15.6 and 17.4 centimetres. The initial and final means of mental training group were found to be 15.6 and 16.8 centimetres. The initial and final means of combined training group were found to be 15.6 and 17.8 centimetres. The initial and final means of control group were found to be 15.6 and 15.6 centimetres. The differences between the initial and final means of the three groups except the control groups had improved in their performance in leg explosive power.

Table: 4.7 Initial, Final and ordered adjusted means of Leg explosive power

Groups	Resistance Training Group	Mental Training Group	Combined Training Group	Control Group
Initial Means	15.6	15.6	15.6	15.6
Final Means	17.4	16.8	17.8	15.6
Adjusted Means	17.4	17.0	17.5	15.6

ANCOVA was applied on the performance of resistance training group, mental training group, the combined training group and the control group for ascertaining that the differences among the means of leg explosive power among the four groups were not by chance and only due to the intervention of the experimental treatment. The ordered adjusted means of leg explosive power were subjected to the statistical treatment.

Table 4.8 displayed the ANCOVA summary of leg explosive power containing the ordered adjusted means and F-ratio. The leg explosive power was significant at $p<0.01$ level of confidence with an F- ratio of 16.17 which explained that the mean differences were not occurred due to chance but the differences were only due to the impact of the experimental treatment on the groups. By entering the F table with 3 and 115 df to determine the F ratios required for significance; these ratios were 3.16 and 5.01 at the $p<0.05$ and $p<0.01$ levels, respectively. Thus, the differences among the four final adjusted means were significant well beyond the $p<0.05$ level, since the F ratio obtained was 16.17. The value of covariance

Table: 4.8 ANCOVA Summary for Leg explosive power

Source	SS	Df	MS	F	P
Adjusted means	78.72	3	26.24	16.17	<.0001
Adjusted error	186.66	115	1.62		
Adjusted total	265.37	118			

becomes apparent that the experimental treatment had good impact on the groups on leg explosive power. The final adjustment means have not been determined as the analysis of covariance was calculated from the adjusted sum of squares. Since the F ratio is significant, the process should continue.

Since the value of F-ratio was greater than the table value, it indicated that there was a significant difference among the means of resistance group, mental training group, combined trained group and the control group on leg explosive power. To find out which of the three paired means had a significant difference, the Scheffe S post-hoc test was applied and the results are presented in table 4.9.

Table: 4.9 Ordered adjusted Leg explosive power means of Combined training, Resistance Training, Mental Training and Control Groups

Combined Training Group	Resistance Training Group	Mental Training Group	Control Group	Mean Difference	F-Ratio
17.8			15.6	2.1	39.24
	17.4		15.6	1.8	26.80
		16.8	15.6	1.1	11.09

Table 4.9 showed the differences between adjusted leg explosive power means of control group had significantly lower mean than the means of combined group and resistance training group at $p<0.01$ level while applying Scheffe S post-hoc test with F-ratio of 39.24 and 26.80. The difference between the means of and mental training group and control group was also significant at $p<0.05$ levels with F- ratio of 11.09. It was inferred that the combined group had improved the leg explosive power level than the resistance training group and the mental training group. On the basis of the data provided in Table 4.7, the graphical representation for better understanding of the variables had been provided. The leg explosive power had been improved better by the combined training group, resistance training group and the mental training group. These mean differences had been established using the statistical techniques. The improvement in the means was not just by chance but only due to the experimental treatments the groups underwent.

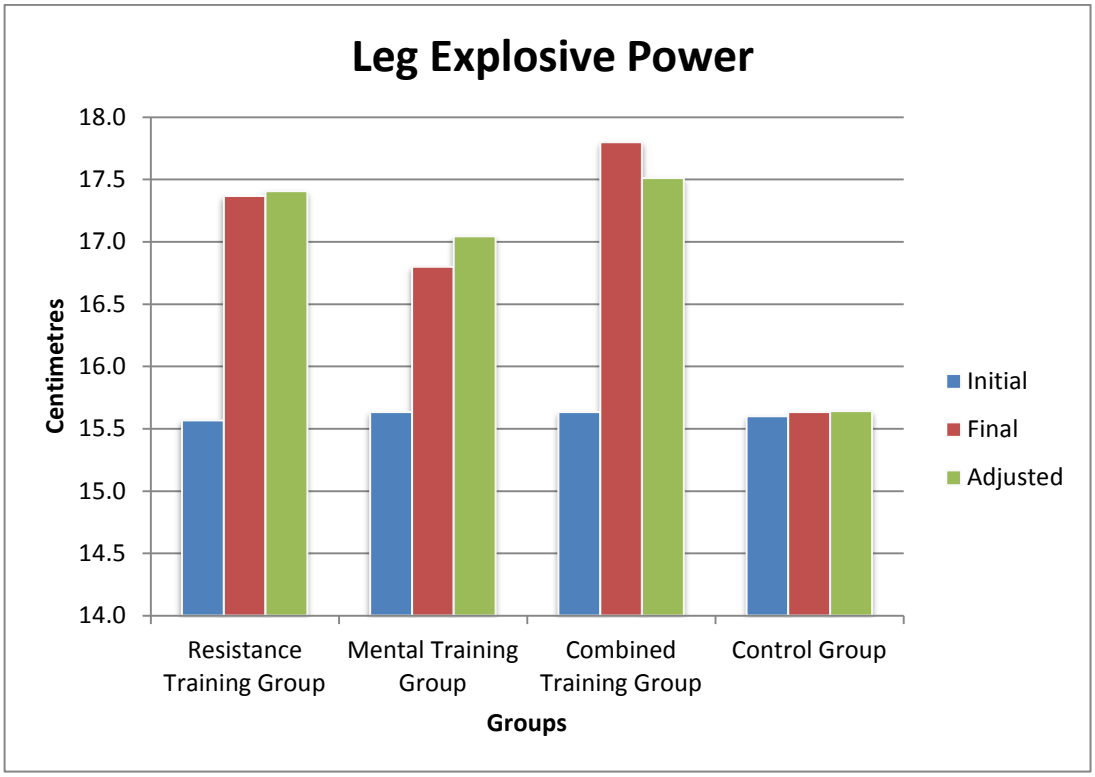

Fig: 4.3 Comparison of means of Leg explosive power

4.2 Psychological Variables

Abreu and Duarte (2015) articulated that sports Science was a fairly new and much needed scientific discipline that has been gaining terrain in the scientific community. However, and similarly to other novel disciplines, in order to gain a place as a consolidated scientific discipline, there was a certain need of assertion. Such assertion of a new field of research mainly relied on the development of novel and insightful theories. Nevertheless, the new need not oppose the old, and findings from other, more established fields of research, need not be negated as a form of affirmation of the newer discipline. Typically, Sports Science approached this theme without integrating findings from other areas such as Experimental and Social Psychology and Neuroscience. They suggested that those are but different levels of analysis that could be reconciled and that such reconciliation should render Sports Science a more comprehensive and richer domain.

Every volleyball player need to have a very strong faith of their own psychology when they play a competitive game. The fear of failure, anxiety to perform better before the audience and the self confidence to play as a team were found to be most important psychological variables for the player to possess. Anxiety and fear of failure are two

important aspects of any player that influence the performance of any player. Hence, out of so many psychological variables that determine the ability and execution of the player, the scholar felt it necessary to organise a psychological training to improve the quality of the sports competition anxiety, achievement motivation and self confidence through counselling, video shows and other means. The results of the study are presented below.

4.2.1 Data analysis for Sports competition anxiety

The initial, final and ordered adjusted means of sports competition anxiety are presented in table 4.10. The obtained means of the dependant variable sports competition anxiety were found to have increased from their initial means when compared with the control group. The initial and final mean scores of resistance training group were found to be 21.9 and 20.9. The initial and final mean scores of mental training group were found to be 20.2 and 20.9. The initial and final mean scores of combined training group were found to be 21.9 and 21.0. The initial and final mean scores of control group were found to be 22.0 and 22.2. The differences between the initial and final means of the three groups except the control groups had improved in their performance in sports competition anxiety.

Table: 4.10 Initial, Final and ordered adjusted means of Sports competition anxiety

Groups	Resistance Training Group	Mental Training Group	Combined Training Group	Control Group
Initial Means	21.9	22.0	21.9	22.0
Final Means	20.9	20.0	21.0	22.2
Adjusted Means	20.9	20.0	21.0	22.2

ANCOVA was applied on the performance of resistance training group, mental training group, the combined training group and the control group for ascertaining that the differences among the means of sports competition anxiety among the four groups were not by chance and only due to the intervention of the experimental treatment. The ordered adjusted means of sports competition anxiety were subjected to the statistical treatment.

Table 4.11 displayed the ANCOVA summary of sports competition anxiety containing the ordered adjusted means and F-ratio. The sports competition anxiety was significant at $p<0.01$ level of confidence with an F- ratio of 3.45 which explained that the mean differences were not occurred due to chance but the differences were only due to the

impact of the experimental treatment on the groups. By entering the F table with 3 and 115 df to determine the F ratios required for significance; these ratios were 3.16 and 5.01 at the $p<0.05$ and $p<0.01$ levels respectively. Thus, the differences among the four final adjusted means were significant well beyond the $p<0.05$ level, since the F ratio obtained was 3.45. The value of covariance becomes apparent that the experimental treatment had good impact on the groups on sports competition anxiety. The final adjustment means have not been determined as the analysis of covariance was calculated from the adjusted sum of squares. Since the F ratio is significant, the process should continue.

Table: 4.11 ANCOVA Summary for Sports competition anxiety

Source	SS	Df	MS	F	P
Adjusted means	70.59	3	23.53	3.45	0.019
Adjusted error	783.9	115	6.82		
Adjusted total	854.4	118			

Since the value of F-ratio was greater than the table value, it indicated that there was a significant difference among the means of resistance group, mental training group, combined trained group and the control group on sports competition anxiety. To find out which of the three paired means had a significant difference, the Scheffe S post-hoc test was applied and the results are presented in table 4.12.

Table: 4.12 Ordered adjusted Sports competition anxiety means of Combined training, Resistance Training, Mental Training and Control Groups

Mental Training Group	Resistance Training Group	Combined Training Group	Control Group	Mean Difference	F-Ratio
20.0			22.2	2.2	10.25
	20.9		22.2	1.2	3.36
		21.0	22.2	1.2	3.03

Table 4.12 showed the differences between adjusted sports competition anxiety means of control group had significantly lower mean than the means of mental training group and resistance training group at $p<0.01$ level while applying Scheffe S post-hoc test with F-ratio of 10.25 and 3.36. The difference between the means of and mental training group and control group was not significant at $p<0.05$ levels with F- ratio of 3.03. It was inferred that the combined group had improved the sports competition anxiety level than

the resistance training group and the mental training group. On the basis of the data provided in Table 4.10, the graphical representation for better understanding of the variables had been provided. The sports competition anxiety had been improved better by the combined training group, resistance training group and the mental training group. These mean differences had been established using the statistical techniques. The improvement in the means was not just by chance but only due to the experimental treatments the groups underwent.

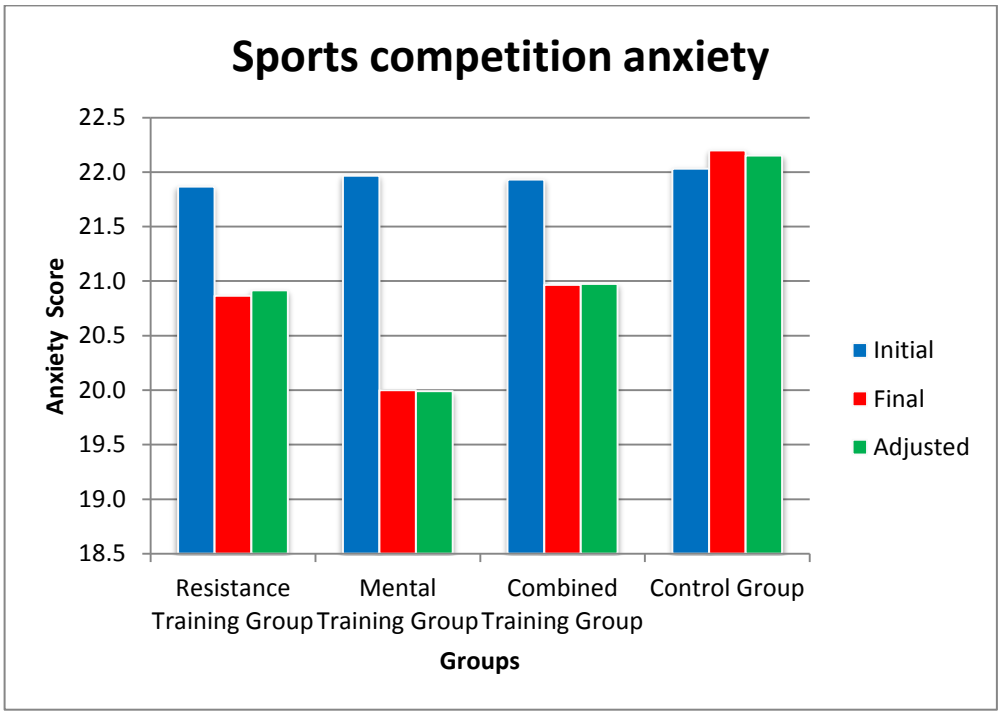

Fig: 4.4 Comparison of means of Sports competition anxiety

4.2.2 Data analysis for Achievement motivation

The initial, final and ordered adjusted means of achievement motivation are presented in table 4.13. The obtained means of the dependant variable achievement motivation were found to have increased from their initial means when compared with the control group. The initial and final mean scores of resistance training group were found to be 13.4 and 11.9. The initial and final mean scores of mental training group were found to be 13.5 and 10.9. The initial and final mean scores of combined training group were found to be 13.7and 10.2. The initial and final mean scores of control group were found to be

13.5 and 13.4. The differences between the initial and final means of the three groups except the control groups had improved in their performance in achievement motivation.

Table: 4.13 Initial, Final and ordered adjusted means of Achievement motivation

Groups	Resistance Training Group	Mental Training Group	Combined Training Group	Control Group
Initial Means	13.4	13.5	13.7	13.5
Final Means	11.9	10.9	10.2	13.4
Adjusted Means	12.0	11.0	10.1	13.4

ANCOVA was applied on the performance of resistance training group, mental training group, the combined training group and the control group for ascertaining that the differences among the means of achievement motivation among the four groups were not by chance and only due to the intervention of the experimental treatment. The ordered adjusted means of achievement motivation were subjected to the statistical treatment.

Table 4.14 displayed the ANCOVA summary of achievement motivation containing the ordered adjusted means and F-ratio. The achievement motivation was significant at $p<.01$ level of confidence with an F- ratio of 10.23 which explained that the mean differences were not occurred due to chance but the differences were only due to the impact of the experimental treatment on the groups. By entering the F table with 3 and 115 df to determine the F ratios required for significance; these ratios were 3.16 and 5.01 at the $p<0.05$ and $p<0.01$ levels, respectively. Thus, the differences among the four final adjusted means were significant well beyond the $p<0.05$ level, since the F ratio obtained was 10.23 The value of covariance becomes apparent that the experimental treatment had good impact on the groups on sports competition anxiety. The final adjustment means have not been determined as the analysis of covariance was calculated from the adjusted sum of squares. Since the F ratio is significant, the process should continue.

Table: 4.14 ANCOVA Summary for Achievement motivation

Source	SS	df	MS	F	P
Adjusted means	189.92	3	63.31	10.23	5E-06
Adjusted error	711.39	115	6.19		
Adjusted total	901.31	118			

Since the value of F-ratio was greater than the table value, it indicated that there was a significant difference among the means of resistance group, mental training group, combined trained group and the control group on achievement motivation. To find out which of the three paired means had a significant difference, the Scheffe S post-hoc test was applied and the results are presented in table 4.15.

Table: 4.15 Ordered adjusted Achievement motivation means of Combined training, Resistance Training, Mental Training and Control Groups

Combined Training Group	Mental Training Group	Resistance Training Group	Control Group	Mean Difference	F-Ratio
10.1			13.4	3.4	27.73
	11.0		13.4	2.5	14.71
		12.0	13.4	1.5	5.31

Table 4.15 showed the differences between adjusted achievement motivation means of control group had significantly lower mean than the means of combined group and resistance training group at $p<0.01$ level while applying Scheffe S post-hoc test with F-ratio of 27.73 and 14.71. The difference between the means of and mental training group and control group was significant at $p<0.01$ levels with F- ratio of 5.31. It was inferred that the combined group had improved the achievement motivation level than the resistance training group and the mental training group. On the basis of the data provided in Table 4.13, the graphical representation for better understanding of the variables had been provided. The achievement motivation had been improved better by the combined training group, mental training group and the resistance training group. These mean differences had been established using the statistical techniques. The improvement in the means was not just by chance but only due to the experimental treatments the groups underwent.

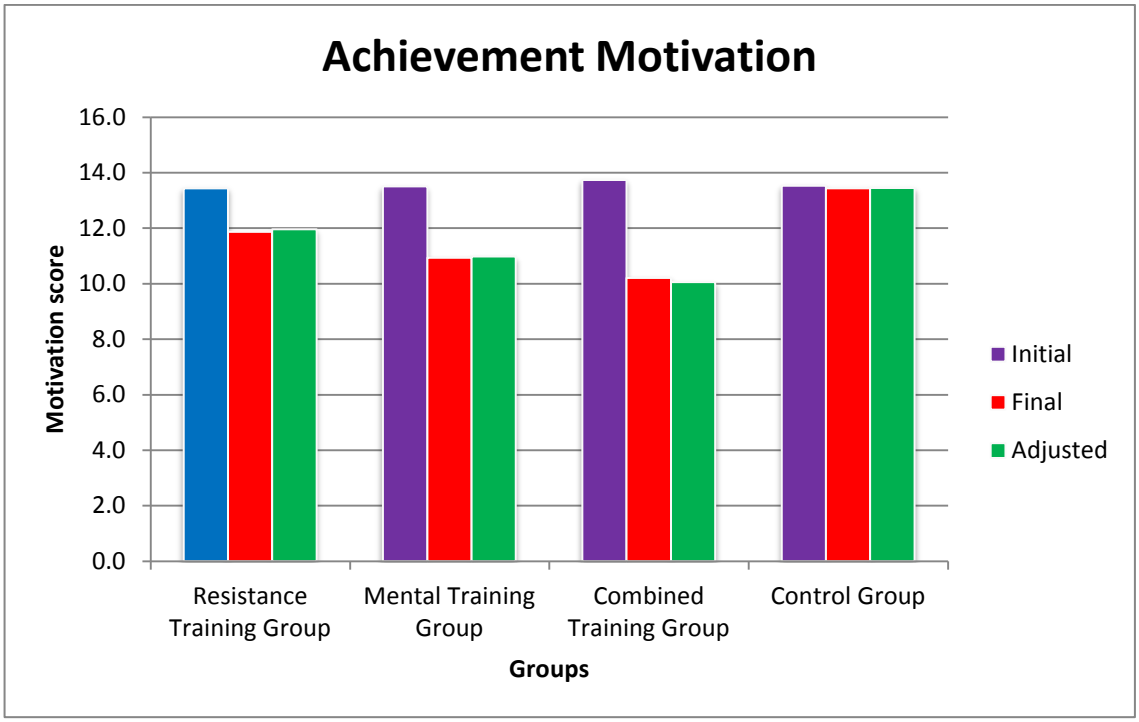

Fig: 4.5 Comparison of means of Achievement motivation

4.2.3 Data analysis for Self confidence

Keikha, Yousef and Jourkesh (2015) found self-confidence among one of the pre-competition psychological states had been claimed to be one of the factors in predicting sport performance in a varied range of sports. The aim of current study was to measure pre-competition mood states and state anxiety components to predict the result of competition. The number of 219 participants were selected for this study, range from 18 to 26 years old (M=1.74, SD = 0.60 yr.; male = 99, female = 120); who represented the UiTM team participated in the study. The participants completed the Profile of Mood States-Adolescent (POMS-A) and the Competitive State Anxiety Inventory-2 (CSAI-2) at three difference temporal patterns including one week, one day and one hour prior to competition. Logistic regression was conducted to assess whether the nine variables, anger, confusion, depression, fatigue, tension, vigor, cognitive anxiety, somatic anxiety and self-confidence, significantly predicted whether the result of the competition is win or lose. The Wald statistics and change in -2 log-likelihood were used to examining the significance of the regression coefficients of the hypothesized predictors. The result of binary logistic regression showed that there were not significant differences in one week and one day hour before competition. However, results revealed that the model was significantly meaningful

for three sub-scales of mood state (fatigue, tension and vigor) out of nine measured independent variables only at one day before competition. Remarkably, it meant that the model could correctly predict 63.1% of the winners and 26% of the losers. This shows that the regression model for only one day before competition was excelled at predicting the winner and not the losers.

The initial, final and ordered adjusted means of self confidence are presented in table 4.16. The obtained means of the dependant variable self confidence were found to have increased from their initial means when compared with the control group. The initial and final mean scores of resistance training group were found to be 28.0 and 26.6. The initial and final mean scores of mental training group were found to be 29.1 and 26.5. The initial and final mean scores of combined training group were found to be 29.8 and 26.6. The initial and final mean scores of control group were found to be 26.7 and 26.6. The differences between the initial and final means of the three groups except the control groups had improved in their performance in self confidence.

Table: 4.16 Initial, Final and ordered adjusted means of Self confidence

Groups	Resistance Training Group	Mental Training Group	Combined Training Group	Control Group
Initial Means	28.0	29.1	29.8	26.7
Final Means	26.6	26.5	26.6	26.6
Adjusted Means	26.9	26.1	25.7	27.7

ANCOVA was applied on the performance of resistance training group, mental training group, the combined training group and the control group for ascertaining that the differences among the means of self confidence among the four groups were not by chance and only due to the intervention of the experimental treatment. The ordered adjusted means of self confidence were subjected to the statistical treatment.

Table 4.17 displayed the ANCOVA summary of self confidence containing the ordered adjusted means and F-ratio. The self confidence was significant at $p<0.01$ level of confidence with an F- ratio of 4.69 which explained that the mean differences were not occurred due to chance but the differences were only due to the impact of the experimental treatment on the groups. By entering the F table with 3 and 115 df to determine the F ratios required for significance; these ratios were 3.16 and 5.01 at the $p<0.05$ and $p<0.01$

levels, respectively. Thus, the differences among the four final adjusted means were significant well beyond the $p<0.05$ level, since the F ratio obtained was 4.69. The value of covariance becomes apparent that the experimental treatment had good impact on the groups on self confidence. The final adjustment means have not been determined as the analysis of covariance was calculated from the adjusted sum of squares. Since the F ratio is significant, the process should continue.

Table: 4.17 ANCOVA Summary for Self confidence

Source	SS	df	MS	F	P
Adjusted means	46.96	3	15.65	4.69	0.004
Adjusted error	383.46	115	3.33		
Adjusted total	430.42	118			

Since the value of F-ratio was greater than the table value, it indicated that there was a significant difference among the means of resistance group, mental training group, combined trained group and the control group on self confidence. To find out which of the three paired means had a significant difference, the Scheffe S post-hoc test was applied and the results are presented in table 4.18.

Table: 4.18 Ordered adjusted Self confidence means of Combined training, Resistance Training, Mental Training and Control Groups

Combined Training Group	Mental Training Group	Resistance Training Group	Control Group	Mean Difference	F-Ratio
25.7			27.7	2.0	18.00
	26.1		27.7	1.6	11.26
		26.9	27.7	0.8	3.20

Table 4.18 showed the differences between adjusted self confidence means of control group had significantly lower mean than the means of combined group and mental training group at $p<0.01$ level while applying Scheffe S post-hoc test with F-ratio of 18.00 and 11.26. The difference between the means of and resistance training group and control group was significant at $p<0.01$ levels with F- ratio of 3.20. It was inferred that the combined group had improved the self confidence level than the resistance training group and the mental training group. On the basis of the data provided in Table 4.16, the graphical representation for better understanding of the variables had been provided. The self confidence had been improved better by the combined training group, mental training

group and the resistance training group. These mean differences had been established using the statistical techniques. The improvement in the means was not just by chance but only due to the experimental treatments the groups underwent.

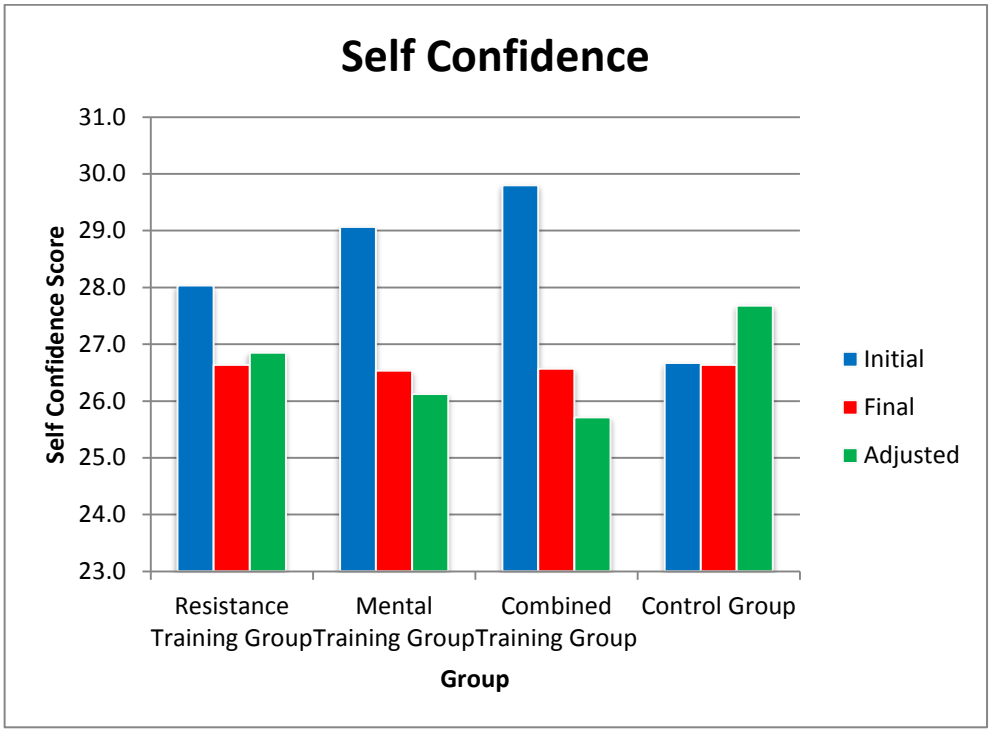

Fig- 4.6 Comparison of means of Self confidence

4.3 Volleyball Skills

The six basic volleyball skills are passing, setting, spiking, blocking, digging, and serving. Passing is often thought of as the most important skill in volleyball. If you can't pass the serve, then you won't ever put your team in a position to score a point. The importance of serving is often undervalued. Many coaches don't teach players to serve aggressive and use this opportunity to give the team an advantage for scoring points. Blocking is perhaps the least taught skill in volleyball. Players can get away with poor blocking skills because not blocking isn't going to hurt the team as much as being poor at executing other skills in volleyball. Digging is another skill that isn't focused on quite as much as most skills in volleyball. The setter position is considered to be the most important position in volleyball. The setter basically runs the team offense. (*Volleyball skills*, n.d)

4.3.1 Data analysis for Volleyball service skill

The initial, final and ordered adjusted means of volleyball service skill are presented in table 4.19. The obtained means of the dependant variable volleyball service skill were found to have increased from their initial means when compared with the control group. The initial and final mean scores of resistance training group were found to be 41.7 and 46.9. The initial and final mean scores of mental training group were found to be 41.8 and 44.3. The initial and final mean scores of combined training group were found to be 41.7 and 47.5. The initial and final mean scores of control group were found to be 41.7 and 41.7. The differences between the initial and final means of the three groups except the control groups had improved in their performance in volleyball service skill.

Table: 4.19 Initial, Final and ordered adjusted means of Volleyball service skill

Groups	Resistance Training Group	Mental Training Group	Combined Training Group	Control Group
Initial Means	41.7	41.8	41.7	41.7
Final Means	46.9	44.3	47.5	41.7
Adjusted Means	46.9	44.3	47.5	41.7

ANCOVA was applied on the performance of resistance training group, mental training group, the combined training group and the control group for ascertaining that the differences among the means of volleyball service skill among the four groups were not by chance and only due to the intervention of the experimental treatment. The ordered adjusted means of volleyball service skill were subjected to the statistical treatment.

Table 4.20 displayed the ANCOVA summary of self confidence containing the ordered adjusted means and F-ratio. The volleyball service skill was significant at $p<0.01$ level of confidence with an F- ratio of 5.17 which explained that the mean differences were not occurred due to chance but the differences were only due to the impact of the experimental treatment on the groups. By entering the F table with 3 and 115 df to determine the F ratios required for significance; these ratios were 3.16 and 5.01 at the $p<0.05$ and $p<0.01$ levels, respectively. Thus, the differences among the four final adjusted means were significant well beyond the $p<0.05$ level, since the F ratio obtained was 5.17. The value of covariance becomes apparent that the experimental treatment had good impact on the groups on volleyball service skill. The final adjustment means have not been

determined as the analysis of covariance was calculated from the adjusted sum of squares. Since the F ratio is significant, the process should continue.

Table: 4.20 ANCOVA Summary for Volleyball service skill

Source	SS	df	MS	F	P
Adjusted means	635.11	3	211.7	5.17	0.0022
Adjusted error	4709.59	115	40.95		
Adjusted total	5344.7	118			

Since the value of F-ratio was greater than the table value, it indicated that there was a significant difference among the means of resistance group, mental training group, combined trained group and the control group on self confidence. To find out which of the three paired means had a significant difference, the Scheffe S post-hoc test was applied and the results are presented in table 4.21.

Table: 4.21 Ordered adjusted Volleyball service skill means of Combined training, Resistance Training, Mental Training and Control Groups

Combined Training Group	Resistance Training Group	Mental Training Group	Control Group	Mean Difference	F-Ratio
47.5			41.7	5.8	12.68
	46.9		41.7	5.2	10.40
		44.3	41.7	2.6	2.61

Table 4.21 showed the differences between adjusted self confidence means of control group had significantly lower mean than the means of combined group and resistance training group at $p<0.01$ level while applying Scheffe S post-hoc test with F-ratio of 12.68 and 10.40. The difference between the means of and mental training group and control group was not significant at $p<0.05$ levels with F- ratio of 2.61. It was inferred that the combined group had improved the self confidence level than the resistance training group and the mental training group. On the basis of the data provided in Table 4.19, the graphical representation for better understanding of the variables had been provided. The volleyball service skill had been improved better by the combined training group, resistance training group and the mental training group. These mean differences had been established using the statistical techniques. The improvement in the means was not just by chance but only due to the experimental treatments the groups underwent.

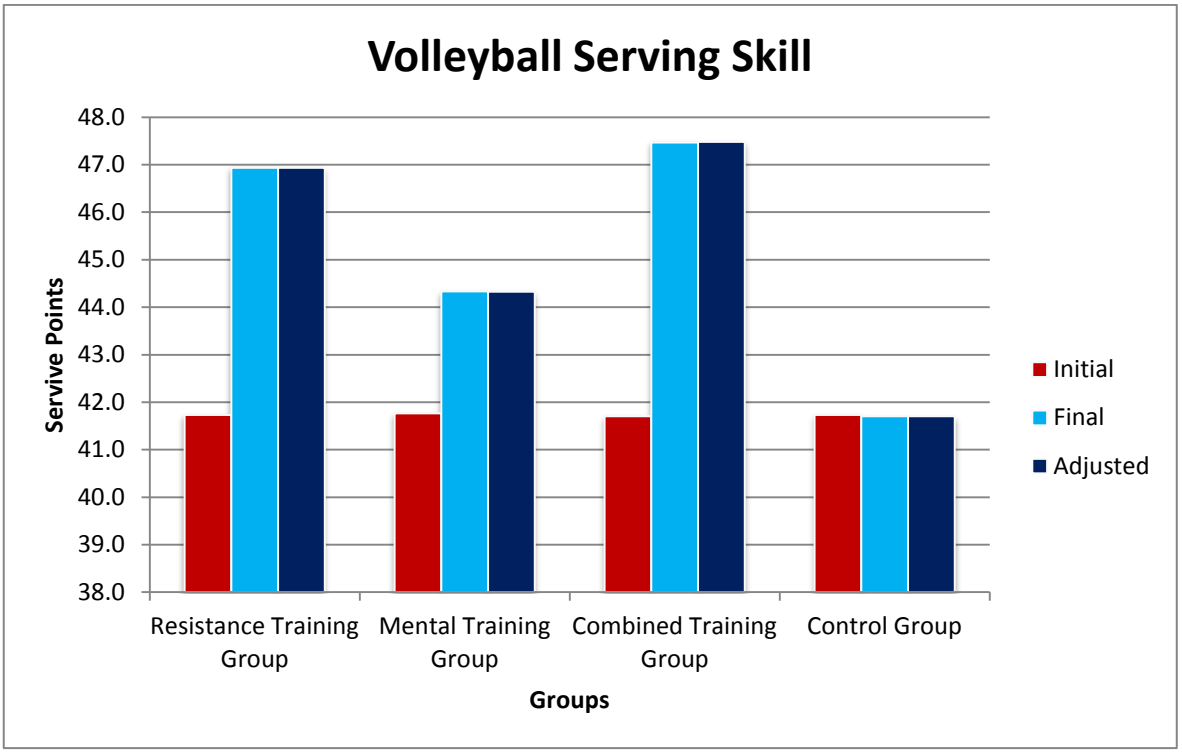

Fig: 4.7 Comparison of means of Volleyball Service skill

4.3.2 Data analysis for Volleyball passing skill

The initial, final and ordered adjusted means of volleyball passing skill are presented in table 4.22. The obtained means of the dependant variable volleyball passing skill were found to have increased from their initial means when compared with the control group. The initial and final mean scores of resistance training group were found to be 41.5 and 47.8. The initial and final mean scores of mental training group were found to be 41.6 and 45.8. The initial and final mean scores of combined training group were found to be 41.5 and 50.6. The initial and final mean scores of control group were found to be 41.6 and 41.7. The differences between the initial and final means of the three groups except the control groups had improved in their performance in volleyball passing skill.

Table: 4.22 Initial, Final and ordered adjusted means of Volleyball passing skill

Groups	Resistance Training Group	Mental Training Group	Combined Training Group	Control Group
Initial Means	41.5	41.6	41.5	41.6
Final Means	47.8	45.8	50.6	41.7
Adjusted Means	47.8	45.8	50.6	41.6

ANCOVA was applied on the performance of resistance training group, mental training group, the combined training group and the control group for ascertaining that the differences among the means of volleyball passing skill among the four groups were not by chance and only due to the intervention of the experimental treatment. The ordered adjusted means of volleyball passing skill were subjected to the statistical treatment.

Table 4.23 displayed the ANCOVA summary of self confidence containing the ordered adjusted means and F-ratio. The volleyball passing skill was significant at $p<0.01$ level of confidence with an F- ratio of 8.88 which explained that the mean differences were not occurred due to chance but the differences were only due to the impact of the experimental treatment on the groups. By entering the F table with 3 and 115 df to determine the F ratios required for significance; these ratios were 3.16 and 5.01 at the $p<0.05$ and $p<0.01$ levels, respectively. Thus, the differences among the four final adjusted means were significant well beyond the $p<0.05$ level, since the F ratio obtained was 8.88. The value of covariance becomes apparent that the experimental treatment had good impact on the groups on volleyball passing skill. The final adjustment means have not been determined as the analysis of covariance was calculated from the adjusted sum of squares. Since the F ratio is significant, the process should continue.

Table: 4.23 ANCOVA Summary for Volleyball service skill

Source	SS	df	MS	F	P
Adjusted means	1288.68	3	429.56	8.88	2E-05
Adjusted error	5561.6	115	48.36		
Adjusted total	6850.28	118			

Since the value of F-ratio was greater than the table value, it indicated that there was a significant difference among the means of resistance group, mental training group, combined trained group and the control group on self confidence. To find out which of the three paired means had a significant difference, the Scheffe S post-hoc test was applied and the results are presented in table 4.24.

Table: 4.24 Ordered adjusted Volleyball passing skill means of Combined training, Resistance Training, Mental Training and Control Groups

Combined Training Group	Resistance Training Group	Mental Training Group	Control Group	Mean Difference	F-Ratio
50.6			41.6	9.0	24.15
	47.8		41.6	6.2	11.53
		45.8	41.6	4.2	5.24

Table 4.24 showed the differences between adjusted volleyball service skill means of control group had significantly lower mean than the means of combined group and resistance training group atp<0 .01 level while applying Scheffe S post-hoc test with F-ratio of 24.15 and 11.53. The difference between the means of and mental training group and control group was significant at p<0.05 levels with F- ratio of 5.24. It was inferred that the combined group had improved the volleyball passing skill level than the resistance training group and the mental training group. On the basis of the data provided in Table 4.22, the graphical representation for better understanding of the variables had been provided. The volleyball passing skill had been improved better by the combined training group, resistance training group and the mental training group. These mean differences had been established using the statistical techniques. The improvement in the means was not just by chance but only due to the experimental treatments the groups underwent.

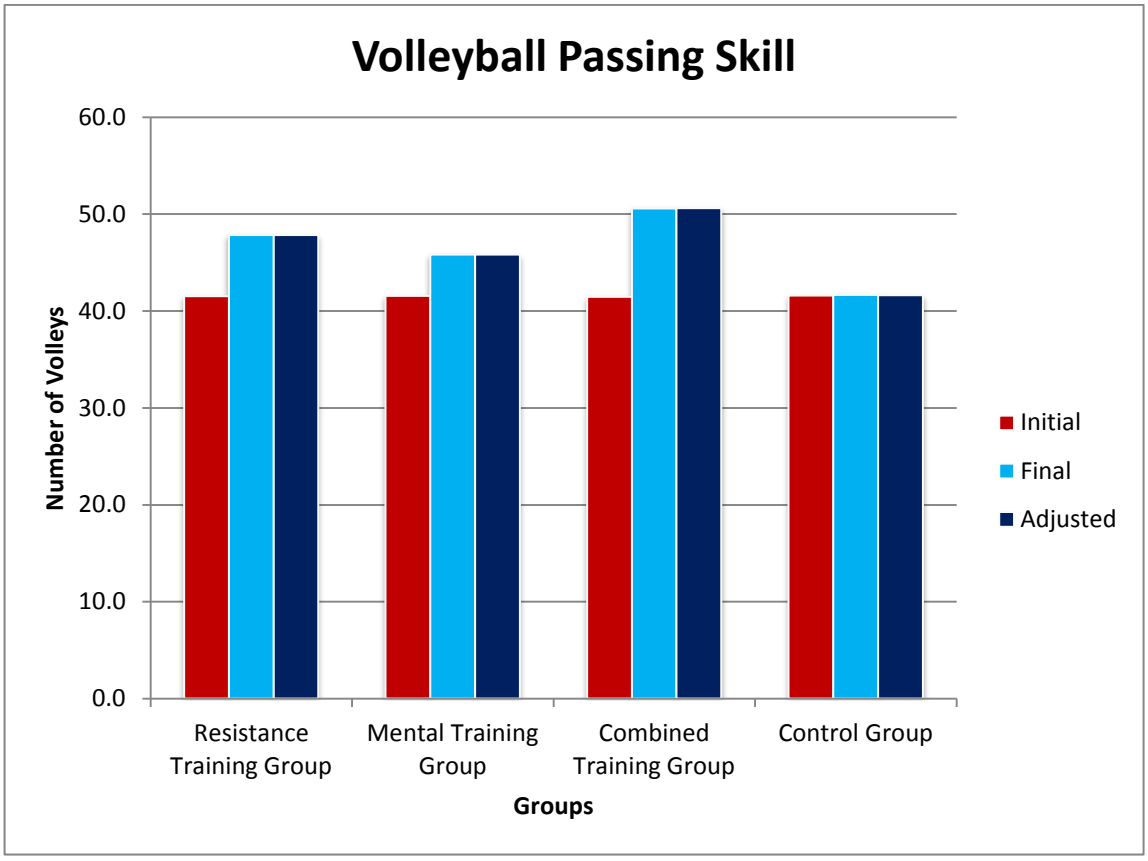

Fig: 4.8 Comparison of means of Volleyball passing skill

4.3.3 Data analysis for Volleyball spiking skill

The initial, final and ordered adjusted means of volleyball spiking skill are presented in table 4.25. The obtained means of the dependant variable volleyball spiking skill were found to have increased from their initial means when compared with the control group. The initial and final mean scores of resistance training group were found to be 22.0 and 24.4. The initial and final mean scores of mental training group were found to be 22.1 and 23.3. The initial and final mean scores of combined training group were found to be 23.3 and 25.8. The initial and final mean scores of control group were found to be 22.5 and 22.6. The differences between the initial and final means of the three groups except the control groups had improved in their performance in volleyball spiking skill.

Table: 4.25 Initial, Final and ordered adjusted means of Volleyball spiking skill

Groups	Resistance Training Group	Mental Training Group	Combined Training Group	Control Group
Initial Means	22.0	22.1	22.3	22.5
Final Means	24.4	23.3	25.8	22.6
Adjusted Means	24.5	23.4	25.8	22.5

ANCOVA was applied on the performance of resistance training group, mental training group, the combined training group and the control group for ascertaining that the differences among the means of volleyball spiking skill among the four groups were not by chance and only due to the intervention of the experimental treatment. The ordered adjusted means of volleyball spiking skill were subjected to the statistical treatment.

Table 4.26 displayed the ANCOVA summary of self confidence containing the ordered adjusted means and F-ratio. The volleyball spiking skill was significant at $p<0.01$ level of confidence with an F- ratio of 4.39 which explained that the mean differences were not occurred due to chance but the differences were only due to the impact of the experimental treatment on the groups. By entering the F table with 3 and 115 df to determine the F ratios required for significance; these ratios were 3.16 and 5.01 at the $p<0.05$ and $p<0.01$ levels, respectively. Thus, the differences among the four final adjusted means were significant well beyond the $p<0.05$ level, since the F ratio obtained was 4.39. The value of covariance becomes apparent that the experimental treatment had good impact on the groups on volleyball spiking skill. The final adjustment means have not been determined as the analysis of covariance was calculated from the adjusted sum of squares. Since the F ratio is significant, the process should continue.

Table: 4.26 ANCOVA Summary for Volleyball spiking skill

Source	SS	df	MS	F	P
Adjusted means	180.27	3	60.09	4.39	0.006
Adjusted error	1572.84	115	13.68		
Adjusted total	1753.12	118			

Since the value of F-ratio was greater than the table value, it indicated that there was a significant difference among the means of resistance group, mental training group, combined trained group and the control group on volleyball spiking skill. To find out

which of the three paired means had a significant difference, the Scheffe S post-hoc test was applied and the results are presented in table 4.27.

Table: 4.27 Ordered adjusted Volleyball spiking skill means of Combined training, Resistance Training, Mental Training and Control Groups

Combined Training Group	Resistance Training Group	Mental Training Group	Control Group	Mean Difference	F-Ratio
25.8			22.5	3.3	11.24
	24.5		22.5	2.0	4.25
		23.4	22.5	0.9	0.92

Table 4.27 showed the differences between adjusted volleyball spiking skill means of control group had significantly lower mean than the means of combined group and resistance training group at$p<0.05$ level while applying Scheffe S post-hoc test with F-ratio of 11.24 and 4.25. The difference between the means of and mental training group and control group was insignificant at $p<0.05$ levels with F- ratio of 0.92. It was inferred that the combined group had improved the volleyball spiking skill level than the resistance training group and the mental training group. On the basis of the data provided in Table 4.25, the graphical representation for better understanding of the variables had been provided. The volleyball spiking skill had been improved better by the combined training group, resistance training group and the mental training group. These mean differences had been established using the statistical techniques. The improvement in the means was not just by chance but only due to the experimental treatments the groups underwent.

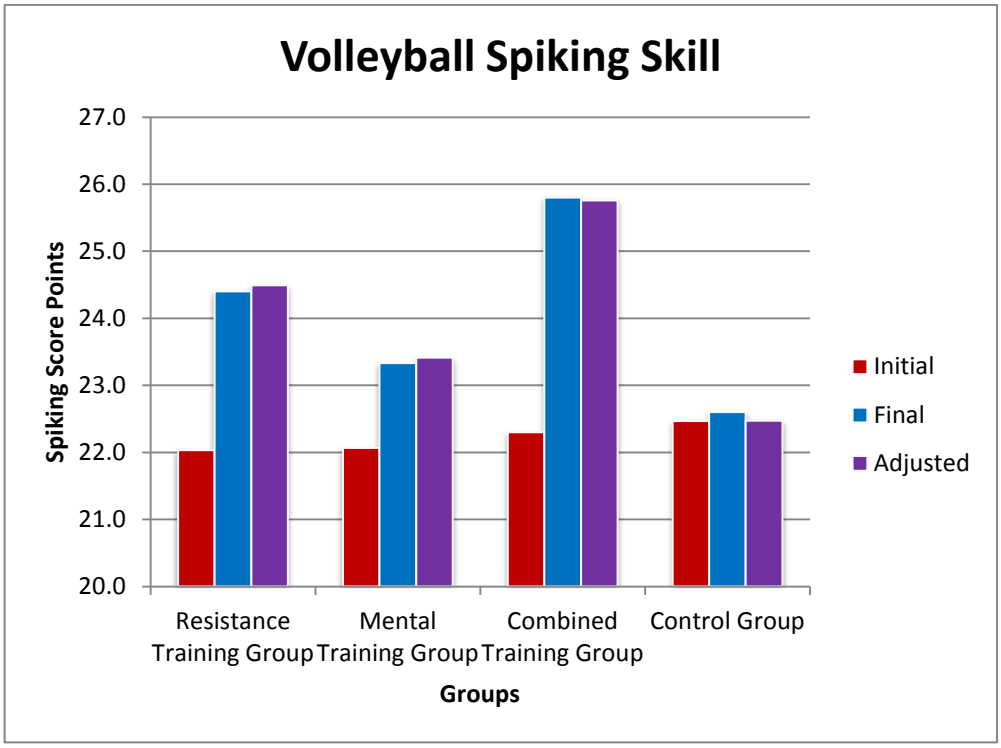

Fig: 4.9 Comparison of means of Volleyball spiking skill

4.4 Discussions on the findings:

It is very crucial to look at the statistical results and the obtained mean differences to come to any conclusions. Also, the method of Analysis of covariance (ANCOVA) was used to analyze the data of the different variables; the covariates occurring during the collection of data would have been removed. The results obtained and the discussions had been presented below.

4.4.1 Discussion on agility

The differences between adjusted agility means of control group had significantly lower mean than the means of combined group and resistance training group at $p<0.01$ level while applying Scheffe S post-hoc test with F-ratio of 23.65 and 15.30. The difference between the means of and mental training group and control group was significant at $p<0.05$ levels with F- ratio of 6.41. It was inferred that the combined group had improved the agility level than the resistance training group and the mental training group. The agility had been improved better by the combined training group, resistance training group and the mental training group. These mean differences had been established using the statistical techniques. The improvement in the means was not just by chance but

only due to the experimental treatments the groups underwent. It might be due to the rigours of the resistance training the general fitness component agility would have improved. Also the combined training group had the mental training; this group would have worked better than any other group. Next group that achieved better results in agility was resistance training group which was quite normal due to the exercises. The thirdly placed group was mental training group. Other than playing regular volleyball, they were not exposed to any other physical training; the improvement on agility was not that much above normal. But when compared to the control group, this group also improved in their agility level. The results of this variable was found in consonance with the studies of Ho et.al., (2015) and Shaikh, (2015).

4.4.2 Discussion on speed

The differences between adjusted speed means of control group had significantly lower mean than the means of combined group and resistance training group at $p<0.01$ level while applying Scheffe S post-hoc test with F-ratio of 23.78 and 15.77. The difference between the means of and mental training group and control group was not significant at $p<0.05$ levels with F- ratio of 8.05. It was inferred that the combined group had improved the speed level than the resistance training group and the mental training group. The speed had been improved better by the combined training group, resistance training group and the mental training group. These mean differences had been established using the statistical techniques. The improvement in the means was not just by chance but only due to the experimental treatments the groups underwent. It might be due to the rigours of the resistance training the general fitness component speed would have improved. Also the combined training group had the mental training; this group would have worked better than any other group. Next group that achieved better results in speed was resistance training group which was quite normal due to the exercises. The thirdly placed group was mental training group. Other than playing regular volleyball, they were not exposed to any other physical training; the improvement on speed was not that much above normal. But when compared to the control group, this group also improved in their speed level. The result of the study on speed is in consonance with the studies of Rodríguez-Ruiz, et al., (2014) and Díez Vega, et al., (2015).

4.4.3 Discussion on leg explosive power

The differences between adjusted leg explosive power means of control group had significantly lower mean than the means of combined group and resistance training group at .01 level while applying Scheffe S post-hoc test with F-ratio of 39.24 and 26.80. The difference between the means of and mental training group and control group was also significant at $p<0.05$ levels with F- ratio of 11.09. It was inferred that the combined group had improved the leg explosive power level than the resistance training group and the mental training group. It may be due to the nature of training they had during the experimental period. The results of the study on the variable explosive power were found to be in agreement with the study of Kumar and Anbalagan, (2014).

4.4.4 Discussion on sports competition anxiety

The differences between adjusted sports competition anxiety means of control group had significantly lower mean than the means of mental training group and resistance training group at $p<0.01$ level while applying Scheffe S post-hoc test with F-ratio of 10.25 and 3.36. The difference between the means of and mental training group and control group was not significant at $p<0.05$ levels with F- ratio of 3.03. It was inferred that the combined group had improved the sports competition anxiety level than the resistance training group and the mental training group. Since this group did not participate in rigorous physical activity other than playing regularly and attending the mental training. Hence, this group might have exhibited their mental balance in the training. The results of the study on the psychological variable sports competition anxiety was found to concur with the studies of Yadav, (2015) and Coetzee, Jooste and Mostert, (2014).

4.4.5 Discussion on achievement motivation

The differences between adjusted achievement motivation means of control group had significantly lower mean than the means of combined group and resistance training group at $p<0.01$ level while applying Scheffe S post-hoc test with F-ratio of 27.73 and 14.71. The difference between the means of and mental training group and control group was significant at $p<0.01$ levels with F- ratio of 5.31. It was inferred that the combined group had improved the achievement motivation level than the resistance training group and the mental training group. Since this group did not participate in rigorous physical activity other than playing regularly and attending the mental training, this group might

have exhibited their level of achievement motivation. The findings of the study on the variable achievement motivation were found to coincide with the study of Vink, Raudsepp and Kais (2015).

4.4.6 Discussion on self confidence

The differences between adjusted self confidence means of control group had significantly lower mean than the means of combined group and mental training group at $p<0.01$ level while applying Scheffe S post-hoc test with F-ratio of 18.00 and 11.26. The difference between the means of and resistance training group and control group was significant at $p<0.01$ levels with F- ratio of 3.20. It was inferred that the combined group had improved the self confidence level than the resistance training group and the mental training group. Here again, the combined training group had improved in the psychological variable of self confidence. It may be due to the physical training they had and the psychological training they underwent. More studies might be under taken to establish the factor of self confidence. The results and findings on self confidence were in agreement with the study of Shoenfelt and Griffith (2008).

4.4.7 Discussion on volleyball service skills

The differences between adjusted volleyball service skill means of control group had significantly lower mean than the means of combined group and resistance training group at $p<0.01$ level while applying Scheffe S post-hoc test with F-ratio of 24.15 and 11.53. The difference between the means of and mental training group and control group was significant at $p<0.05$ levels with F- ratio of 5.24. It was inferred that the combined group had improved the volleyball passing skill level than the resistance training group and the mental training group.

4.4.8 Discussion on volleyball passing skill

The differences between adjusted volleyball service skill means of control group had significantly lower mean than the means of combined group and resistance training group at .01 level while applying Scheffe S post-hoc test with F-ratio of 24.15 and 11.53. The difference between the means of and mental training group and control group was significant at $p<0.05$ levels with F- ratio of 5.24. It was inferred that the combined group

had improved the volleyball passing skill level than the resistance training group and the mental training group.

4.4.9 Discussion on volleyball spiking skill

The differences between adjusted volleyball spiking skill means of control group had significantly lower mean than the means of combined group and resistance training group at $p<0.05$ level while applying Scheffe S post-hoc test with F-ratio of 11.24 and 4.25. The difference between the means of and mental training group and control group was insignificant at $p<0.05$ levels with F- ratio of 0.92. It was inferred that the combined group had improved the volleyball spiking skill level than the resistance training group and the mental training group.

The findings on the three volleyball skill variables were found to be in consonance with the studies of Jayakumar and Vairamani, a & b (2015).

4.5. Discussion on hypotheses

1. The hypothesis that there would be a significant difference on the selected motor variables among the resistance training group, mental training group, combined training group and the control group was accepted.

2. The hypothesis that there would be a significant difference on the selected psychological variables among the resistance training group, mental training group, combined training group and the control group was accepted.

3. The hypothesis that there would be a significant difference on the selected volleyball skill related variables among the resistance training group, mental training group, combined training group and the control group was accepted.

The following figure might be of help to assess and just compare the F-ratios by different groups by different variables.

Table: 4.28 F-Ratios of All the variables among different groups

	Agility	Speed	Explosive Power	Anxiety	Motivation	Confidence	Serve	Pass	Spike
Combined Group	23.65	23.78	39.24	28.45	27.73	18.00	12.68	24.15	11.24
Resistance Group	15.30	15.77	26.80	13.67	14.71	3.20	10.40	11.53	4.25
Mental Group	6.41	8.05	11.09	3.46	5.31	11.26	2.61	5.24	0.92

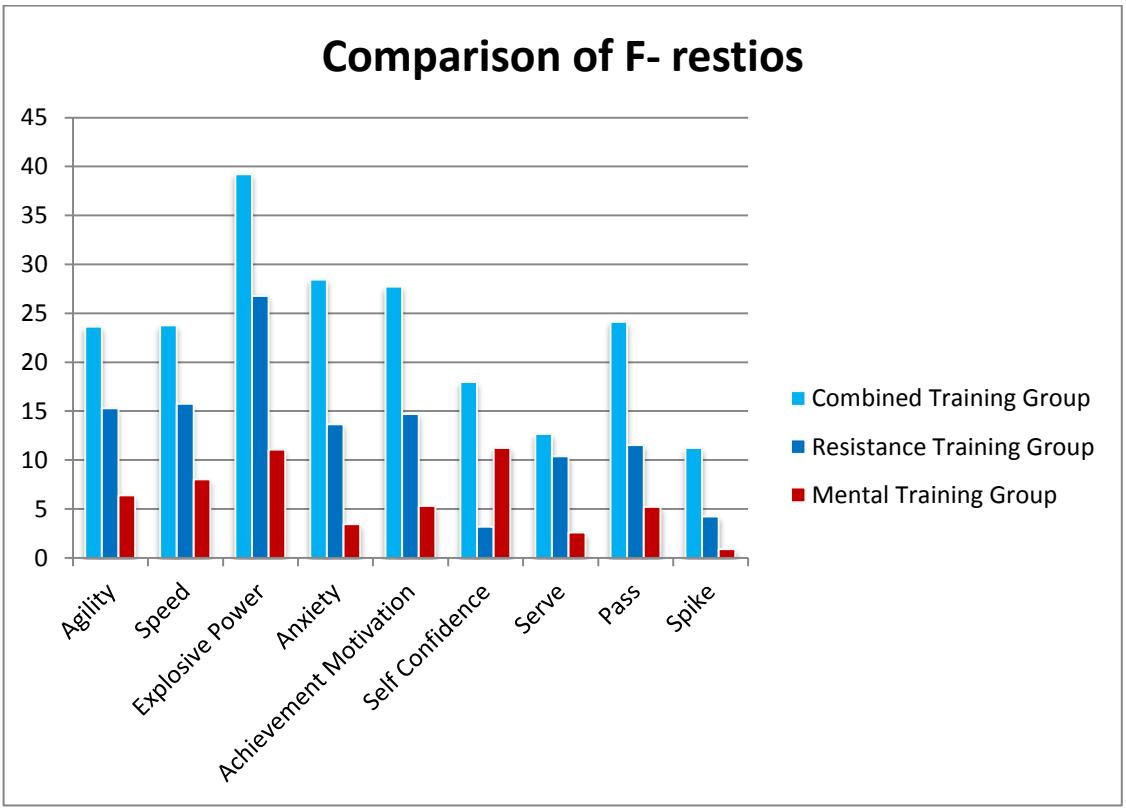

Fig: 4.10 Comparison of F-ratios of all the variables

Chapter V

SUMMARY CONCLUSION AND RECOMMENDATION

Man after his creation, was very fit naturally due to his way of life. He had to be fit for securing his food. He had to run after animals for hunting them for food for his family and himself. At the same time, he had to be fit to keep his family and himself safe from wild animals. So, entire humanity had to be fit for living a life with food and free from dangers of his environment. When they were living in jungles as society and they had two primary tasks of earning a livelihood and being safe. The lame, old and unfit died. Only the fittest survived. They were using spears and blunt weapons for hunting and saving themselves from the threat of their life. They were agile, flexible, fast and stronger to run away from the chasing animals and climb trees and rocks.

Ancient man tamed animals for his convenient way of working on the field when he learnt farming. Even with the help of animals, he had to work along with animals. So, the whole family was working in the farms and they produced grains and stored. So he had a lot of time and his usual fitness level slowly declined and he became lazy sice he was nit compelled to hunt animals. The change of life style primarily made busy humanity into a lazy lot and they faced all problems of laziness caused sedentary life.

When they were exposed into modern life with fire and weapons, they were depending more on the machinery. Slowly, they learnt to adopt themselves into the modern world. They became attracted towards easy way of life due to inventions of modern gadgets. They became dependant of transport and forgot the original way of reaching places by self locomotion, walking. Still, when the science and technology advanced, the humanity became dependant on so many other mechanisms for their daily needs. Grinding on stones turned into grinding with

grinders. Pounding became nonexistent and rice mills came into existence. Washing became mechanized. Like this, the sedentary life style crept into the lives of originally fit humans.

In the leisure time, ancient humanity indulged in competitions with their spears as to how far and how accurate they could throw. They ran to find out who was the fastest. Their leisure time was decided by them and the activities were multifarious. The diverse skills of humans are today being exhibited in the modern forms of games and athletics. The activities have incarnated into the modern forms of Olympic games. The first demonstration game of mintonette or the modern volleyball was played at Springfield College after one year of the inception. After four years of the first game played, a special ball was designed. From then on, the game had grown in leaps and bounds to the level of very competitive international game involving a set of special skills and tactics and is being played throughout the world with the adopted rules. It is today a game of talent, tactics and special powers and is being competed by almost all the countries of the world. The game had become very competitive and fast. The reason behind the change in the style of the game is due to the change of rules and the techniques. The change of rules in this game demand very specific and excellent skills with every player.

5.1 Summary

The purpose of the study was to critically analyze and compare resistance training, mental training and combined training groups on selected motor, psychological and volleyball skill related variables among college men volleyball players of age groups between 19 and 24 years. To achieve this purpose, 120 male volleyball players were selected at random from among the players who had participated in some form of competitive volleyball representing Velammal engineering college, Chennai city who expressed their willingness to participate in the study. They were explained about their role in the study and they were requested to extend their best cooperation in making the purpose of the study meaningful and useful to other public at large. They were informed of the purpose of the study and that they had to be in the experiment for a period of 12 weeks and follow the guidelines of the scholar.

The selected players were divided into 4 groups randomly with 30 members in each group. The first group was the resistance training group. This group consisted of 30 men volleyball players who performed a set of 7 resistance training exercises, three times daily for 45 minutes for 2 days (Mondays and Fridays) in a week under the supervision of the scholar in the school auditorium between 5 and 6 pm. The schedule is given below. The same group walked on sand track for 100 metres and ran back as fast as they can for 3 days (Tuesdays, Wednesdays and Thursdays) in a week. They were asked to take complete rest for two days. They also played volleyball with the other groups regularly.

The second group was mental training group and it was trained with the Mental Skills and to insist that these mental skills were necessary for performing well in sport as well as in non-sport performance situations. At the psychological training sessions,

- It was believed that these skills were learned and can be improved through instruction and practice.
- The work was begun with each individual by assessing his current proficiency in each of the skills.
- A plan was developed for teaching and enhancing the specific skills that needed improvement for the individual.
- The member's proficiency was periodically reassessed in each of the skills in order to evaluate the progress.

The third group was the combined training group and this group was having the following weekly schedule:

Monday:	Weight training for 1 hour with resistance training group
Tuesday:	Mental Training session with mental training group
Wednesday:	Sand running programme for 1 hour with the resistance training group
Thursday:	Mental Training session with mental training group
Friday:	Weight training for 1 hour with resistance training group

This schedule was followed for 12 weeks and the group also played volleyball wi the other groups regularly.

The fourth group was the control group and the control group with 30 members was instructed that they should not indulge in any type of organized physical training programmes or some other types of psychological counseling. But they were allowed to play usual volleyball practice sessions with the other group members.

The scholar in his present study, decided to experiment the following motor behaviour after a due consideration and experimentation,

1. Agility
2. speed
3. leg explosive power

Taking into consideration of the previous studies, the researcher decided as important the following psychological variables:

1. Sports Competition Anxiety
2. Achievement Motivation
3. Self Confidence

For the present study, the researcher selected the following volleyball playing skills:

1. Serving
2. Volleying and
3. Spiking

5.2 Conclusions

Based on the results obtained after administering each variable with statistical technique (ANCOVA), the following conclusions were drawn.

5.2.1 Agility

The differences between adjusted agility means of control group had significantly lower mean than the means of combined group and resistance training group at $p<0.01$ level while applying Scheffe S post-hoc test with F-ratio of 23.65 and 15.30. The difference

between the means of and mental training group and control group was significant at $p<0.05$ levels with F- ratio of 6.41. It was inferred that the combined group had improved the agility level than the resistance training group and the mental training group. The agility had been improved better by the combined training group, resistance training group and the mental training group.

5.2.2 Speed

The differences between adjusted speed means of control group had significantly lower mean than the means of combined group and resistance training group at $p<0.01$ level while applying Scheffe S post-hoc test with F-ratio of 23.78 and 15.77. The difference between the means of and mental training group and control group was not significant at $p<0.05$ levels with F- ratio of 8.05. It was inferred that the combined group had improved the speed level than the resistance training group and the mental training group. The speed had been improved better by the combined training group, resistance training group and the mental training group.

5.2.3 Explosive power

The differences between adjusted leg explosive power means of control group had significantly lower mean than the means of combined group and resistance training group at $p<0.01$ level while applying Scheffe S post-hoc test with F-ratio of 39.24 and 26.80. The difference between the means of and mental training group and control group was also significant at $p<0.05$ levels with F- ratio of 11.09. It was inferred that the combined group had improved the leg explosive power level than the resistance training group and the mental training group. It may be due to the nature of training they had during the experimental period.

5.2.4 Sports competition anxiety

The differences between adjusted sports competition anxiety means of control group had significantly higher mean than the means of mental training group and combined training group, and resistance training group at $p<0.01$ level while applying Scheffe S post-hoc test with F-ratio of 28.45 and 13.67. The difference between the means of and resistance training group and control group was significant at .05 levels with F- ratio of 3.46. It was inferred that the mental training group had improved the sports competition anxiety level than the

combined training group and the resistance training group. Since this group did not participate in rigorous physical activity other than playing regularly and attending the mental training. Hence, this group might have exhibited their mental balance in the training.

5.2.5 Achievement motivation

The differences between adjusted achievement motivation means of control group had significantly lower mean than the means of combined group and resistance training group at $p<0.01$ level while applying Scheffe S post-hoc test with F-ratio of 27.73 and 14.71. The difference between the means of and mental training group and control group was significant at $p<0.01$ levels with F- ratio of 5.31. It was inferred that the combined group had improved the achievement motivation level than the resistance training group and the mental training group. Since this group did not participate in rigorous physical activity other than playing regularly and attending the mental training, this group might have exhibited their level of achievement motivation.

5.2.6 Self confidence

The differences between adjusted self confidence means of control group had significantly lower mean than the means of combined group and mental training group at $p<0.01$ level while applying Scheffe S post-hoc test with F-ratio of 18.00 and 11.26. The difference between the means of and resistance training group and control group was significant at $p<0.01$ levels with F- ratio of 3.20. It was inferred that the combined group had improved the self confidence level than the resistance training group and the mental training group. Here again, the combined training group had improved in the psychological variable of self confidence. It may be due to the physical training they had and the psychological training they underwent. More studies might be under taken to establish the factor of self confidence.

5.2.7 Volleyball service skill

The differences between adjusted volleyball service skill means of control group had significantly lower mean than the means of combined group and resistance training group at $p<0.01$ level while applying Scheffe S post-hoc test with F-ratio of 24.15 and 11.53. The

difference between the means of and mental training group and control group was significant at p<0.05 levels with F- ratio of 5.24. It was inferred that the combined group had improved the volleyball passing skill level than the resistance training group and the mental training group.

5.2.8 Volleyball volleying skill

The differences between adjusted volleyball service skill means of control group had significantly lower mean than the means of combined group and resistance training group at p<0.01 level while applying Scheffe S post-hoc test with F-ratio of 24.15 and 11.53. The difference between the means of and mental training group and control group was significant at p<0.05 levels with F- ratio of 5.24. It was inferred that the combined group had improved the volleyball passing skill level than the resistance training group and the mental training group.

5.2.9 Volleyball spiking skill

The differences between adjusted volleyball spiking skill means of control group had significantly lower mean than the means of combined group and resistance training group at p<0.05 level while applying Scheffe S post-hoc test with F-ratio of 11.24 and 4.25. The difference between the means of and mental training group and control group was insignificant at p<0.05 levels with F- ratio of 0.92. It was inferred that the combined group had improved the volleyball spiking skill level than the resistance training group and the mental training group.

5.3. Recommendations

On the basis of the conclusions made, the following recommendations were made.

1. This study may be conducted for college women volleyball players and new interpretations could be made.
2. The same study might me conducted with different motor fitness variables.

3. The same study could be made with addition of physiological variables with the existing variables.
4. The same study with a different set of psychological variables could be of importance to the coaches and trainers.
5. The study with motor fitness, physiological and psychological variables with a different skills of volleyball could be studied with a larger population.
6. The same study might be of greater value if it is done with novice men or women.
7. This study with motor, physiological, psychological and biochemical variables with aerobic training, plyometric training, yoga training and resistance training may be conducted.

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Appendix I

Sport Competition Anxiety Test (SCAT) Assessing Your Anxiety

Read each statement below, decide if you "Rarely", "Sometimes" or "Often" feel this way when competing in your sport, tick the appropriate box to indicate your response.

S. No	Question Statement	Rarely	Some Times	Often
1	Competing against other People/Teams is socially enjoyable			
2	Before I compete - I feel uneasy			
3	Before I compete - I worry about not performing well			
4	I am a good sportsman when I compete			
5	When I compete - I worry about making mistakes			
6	Before I compete - I am calm			
7	Setting a goal is important when competing			
8	Before I compete - I get a queasy feeling in my stomach			
9	Just before competing - I notice my heart beats faster than usual			
10	I like to compete in games that demands a lot of physical energy			
11	Before I compete - I feel relaxed			
12	Before I compete - I am nervous			
13	Team sports are more exciting than individual sports			
14	I get nervous wanting to start the game			
15	Before I compete - I usually get uptight			

Name :_____

SCAT Score ☐

Less than 17 - You have a low level of anxiety
17 to 24 - You have an average level of anxiety More than 24 You have a high level of anxiety

Appendix II

Sport Competition Anxiety Test (SCAT) Analysis

The score for the response to each question is detailed below. Enter the score for each question in the "Athlete's Score" column and then total the column up to provide a SCAT score.
Note that questions 1,4,7,10 and 13 score zero regardless of the response.

Question No	Rarely	Sometimes	Often		Athlete's Score
1	0	0	0		0
2	1	2	3		
3	1	2	3		
4	0	0	0		0
5	1	2	3		
6	3	2	1		
7	0	0	0		0
8	1	2	3		
9	1	2	3		
10	0	0	0		0
11	1	2	3		
12	1	2	3		
13	0	0	0		0
14	1	2	3		
15	1	2	3		

Total ☐

SCAT ScoreAnalysis

Less than 17	You have a low level of anxiety
17 to 24	You have an average level of anxiety
More than 24	You have a high level of anxiety

Appendix – III

Achievement Motivation Scale

Read each statement and answer True or False to indicate if that statement generally describes you.

S.No	Statement	True	False
1	People who work so hard they make the rest of us look bad really bother me.	True	False
2	I like taking risks.	True	False
3	I ask others for advice even if I think I know the answer, because it is always better to be safe than sorry.	True	False
4	I like it when people say in front of others that I am doing a good job.	True	False
5	I dislike entering a room full of strangers and trying to connect.	True	False
6	If you met me, you would say that I get on well with other people.	True	False
7	I would be more successful, but others try to disrupt my plans.	True	False
8	In a tight situation, I like it when I am in charge and the blame or praise will come to me.	True	False
9	I enjoy spending much of my time alone.	True	False
10	I like being independent.	True	False
11	In fantasies about my career, often I am in a group and they are praising me.	True	False
12	Life would be better if more people stuck to their business so I could stick to mine.	True	False
13	I am basically a competitive person, and I compete just for the sake of competing.	True	False
14	People do not like to admit it, but success in life has less to do with hard work and more to do with luck and being in the right place at the right time.	True	False
15	Having good friends is important, but I could quickly make new ones if I had to.	True	False
16	When it is possible to avoid conflict, I do so.	True	False
17	Most people who know me say I am ambitious.	True	False
18	If jobs and money are on the line, it is a good idea to let someone else be in charge, in case things go sour.	True	False
19	If I knew others disapproved of my actions, it would cause me to rethink my plans.	True	False
20	Being part of a team at work is less important than doing good work on your own.	True	False
21	I regularly list my goals where I can see them during the day.	True	False
22	Most evenings, I kick back and relax rather than prepare for the next day's tasks.	True	False

Interpretation*

22-20: High need for achievement.
19-17: Moderate need for achievement.
16-10: Average need for achievement.
9-6: Moderately low need for achievement.
< 5: Low need for achievement.

Appendix IV

Rekha Agnihotry Self Confidence Questionnaire

Put a X mark in the appropriate column

S.No	Statement	Yes	No
1	It always happens to you that you cannot come to a first decision/conclusion to the last movement of your work.	Yes	No
2	Whenever a subject is brought to you/or asked about the subject you don't to hesitate to give answer to it.	Yes	No
3	Whenever you have a meeting with the public you experience self confidence.	Yes	No
4	Your feelings sometimes hurt others.	Yes	No
5	Whenever you don't want to meet some people you change your route.	Yes	No
6	You always fear that others don't like you.	Yes	No
7	Without any distress you confuse any difficult problems.	Yes	No
8	For a silly thing people unjustly blame.	Yes	No
9	You always deny top play certain games because you know you are not good at it.	Yes	No
10	You always worry / think more on every subject / matter.	Yes	No
11	You don't plainly explain your feeling.	Yes	No
12	You think every one is always interested to get the best out of you.	Yes	No
13	Whenever you start a work you have the fear of losing / not succeeding it.	Yes	No
14	At times when needed you feel that you are unable to give the correct answer that express your feelings.	Yes	No
15	You feel life is very strenuous.	Yes	No
16	You get yourself back to face any problems.	Yes	No
17	To keep yourself concentrate on a subject that is very difficult.	Yes	No
18	Most of the times you have neglected to do the work the assignment given are incapable of doing it.	Yes	No
19	You feel that you are not facing the problems in an orderly manner.	Yes	No
20	You speed most of your time, simply thinking of your future.	Yes	No
21	You have lost some of your golden changes because you are unable to take a quick and final decision.	Yes	No
22	It is believed that you always live in a depressed mood.	Yes	No
23	You make friendship within on time as others do.	Yes	No
24	Whenever your feelings do not match with others you feel mach discouraged.	Yes	No
25	It is believed that you are satisfied within (your imaginary thoughts) your impossible wishes.	Yes	No
26	You don't have a positive way to take without for any Job.	Yes	No
27	You get discouraged immediately.	Yes	No
28	Whenever you get upset in taking more time for you to get back to normally.	Yes	No
29	You feel that nobody understands you.	Yes	No
30	Sometimes you feel discomfort (or) uneasy to sit quietly in one place.	Yes	No
31	You are single you experience yourself with courage and boldness.	Yes	No
32	You are simple you feel yourself and then there is no one for you.	Yes	No
33	You feel difficult to have conversation with your superior.	Yes	No
34	You face difficult to make new friends.	Yes	No
35	At any social gathering discussion instead of active participation you keep yourself as aloof / away.	Yes	No

36	You feel yourself insecure.	Yes	No
37	It is difficult for you to speak before a large gathering.	Yes	No
38	Whenever some one looks at you, you can't do netter than normally you do the job.	Yes	No
39	Whenever some one comments you either favourably or unfavourably you feel distressed.	Yes	No
40	You admire yourself a man of success.	Yes	No
41	You always feel that whatever you want to do, you can do it.	Yes	No
42	You feel difficult to take a firm decision of your own.	Yes	No
43	Whenever you want to move a coin against you every enemy you feel you have done it.	Yes	No
44	You make your decisions so every knowing fully what should be the next step.	Yes	No
45	You keep yourself mentally relaxed by not storming the brain.	Yes	No
46	You feel much believe with those who humiliate the atmosphere.	Yes	No
47	You feel thinking large man is not a worthy man.	Yes	No
48	You are so sensitive, that you start crying immediately.	Yes	No
49	You experience nervousness before when you enter inside a meeting hall.	Yes	No
50	You get frustrated because whatever you (think or work) are wanted to do, you feel it unable to do it.	Yes	No
51	You feel your friend has done something good for this life or living or he is doing well better than that of you.	Yes	No
52	You always live in a state of confusion.	Yes	No
53	When you get a change to become a good leader,or a good politician, you avail it.	Yes	No
54	You feel that no promises can stop you to achieve your goal.	Yes	No
55	You take back yourself with your natural style in any party or a good gathering.	Yes	No
56	Whenever you are to face a difficult task or to fact a tough time you feel what was necessary you do, you did not.	Yes	No

Scoring:

The inventory was scored by hand. One point was awarded for a response indicative of lack of self confidence, that is for making cross (X) to wrong response to item numbers 2,7,23,31,40,41,43,44,45,53,54,55 and for marking cross (X) to right response to the rest of the items. The lower the score, the higher would be the level of self confidence and vice versa.

Appendix V

Raw scores of agility (seconds)

Resistance Run Group		Mental Training Group		Combined Training Group		Control Group	
Initial	Final	Initial	Final	Initial	Final	Initial	Final
22.0	22.0	24.0	23.0	23.0	20.0	24.0	24.0
21.0	18.0	21.0	19.0	19.0	18.0	22.0	22.0
24.0	22.0	23.0	22.0	23.0	22.0	23.0	23.0
23.0	23.0	27.0	28.0	29.0	27.0	29.0	29.0
21.0	22.0	26.0	27.0	28.0	26.0	28.0	28.0
24.0	19.0	23.0	22.0	21.0	18.0	22.0	23.0
25.0	20.0	22.0	21.0	20.0	19.0	22.0	22.0
25.0	22.0	24.0	22.0	23.0	21.0	24.0	24.0
23.0	21.0	24.0	23.0	23.0	22.0	26.0	26.0
21.0	23.0	25.0	24.0	24.0	18.0	23.0	24.0
24.0	20.0	22.0	20.0	21.0	19.0	22.0	22.0
28.0	22.0	23.0	22.0	22.0	22.0	22.0	23.0
29.0	20.0	22.0	22.0	24.0	22.0	22.0	22.0
23.0	23.0	24.0	24.0	29.0	27.0	24.0	24.0
21.0	22.0	23.0	23.0	23.0	22.0	24.0	26.0
25.0	21.0	21.0	20.0	27.0	25.0	22.0	22.0
24.0	24.0	25.0	20.0	25.0	23.0	25.0	24.0
28.0	24.0	23.0	22.0	27.0	26.0	23.0	23.0
27.0	23.0	24.0	21.0	24.0	21.0	23.0	23.0
23.0	30.0	29.0	27.0	30.0	30.0	27.0	26.0
21.0	24.0	25.0	24.0	24.0	22.0	23.0	23.0
26.0	24.0	24.0	23.0	23.0	22.0	25.0	25.0
26.0	24.0	25.0	24.0	24.0	20.0	25.0	25.0
22.0	20.0	21.0	20.0	20.0	18.0	21.0	21.0
24.0	23.0	23.0	22.0	18.0	16.0	23.0	23.0
23.0	22.0	22.0	22.0	20.0	18.0	22.0	22.0
22.0	22.0	22.0	21.0	21.0	19.0	20.0	19.0
23.0	21.0	21.0	20.0	20.0	18.0	22.0	20.0
16.0	17.0	24.0	24.0	24.0	22.0	21.0	22.0
15.0	16.0	23.0	23.0	23.0	22.0	22.0	22.0

Appendix VI

Raw scores of speed (seconds)

Resistance Run Group		Mental Training Group		Combined Training Group		Control Group	
Initial	Final	Initial	Final	Initial	Final	Initial	Final
10.2	10.1	8.2	7.0	7.1	6.9	8.9	9.2
8.7	8.4	9.0	7.2	9.2	6.8	9.9	8.9
7.8	8.0	7.9	8.4	7.2	6.6	9.0	8.7
10.0	9.5	9.4	8.3	7.4	6.8	6.9	7.6
8.4	8.2	8.8	8.5	8.8	8.0	6.8	7.0
9.2	8.9	10.0	8.1	7.9	7.4	7.0	7.5
9.5	8.7	9.4	8.7	9.9	9.0	7.3	7.4
9.2	9.0	7.9	8.1	8.1	8.0	9.9	10.5
7.2	6.5	7.1	6.9	7.3	7.4	7.3	8.2
9.9	7.2	7.9	7.9	9.9	8.4	9.1	8.7
8.7	7.4	9.1	8.2	7.9	7.0	8.3	9.1
8.9	7.5	8.1	7.1	8.8	9.0	9.1	9.2
8.7	8.0	8.8	8.3	8.3	7.0	7.8	8.4
6.5	6.8	7.6	7.4	10.0	9.0	7.0	7.8
8.7	8.2	9.2	8.1	8.0	7.0	7.4	7.6
7.1	6.4	9.9	9.3	9.6	8.2	7.9	8.0
7.8	7.1	7.1	9.4	9.5	8.4	10.0	9.1
6.9	7.2	7.6	7.5	7.5	7.2	8.8	7.8
6.8	6.4	6.9	7.0	9.4	8.9	8.8	8.0
7.8	7.2	8.7	8.2	7.9	7.0	9.5	8.9
7.9	7.2	8.8	8.4	8.1	8.0	6.9	8.5
6.9	7.0	7.9	7.9	6.8	7.2	9.7	9.4
6.1	6.0	8.8	8.6	6.5	6.5	7.6	7.7
7.4	7.1	7.8	8.1	6.7	6.5	6.5	7.6
9.1	8.2	7.9	8.0	8.1	8.0	7.9	7.8
8.9	8.4	7.2	7.1	8.9	8.1	7.1	6.9
9.9	9.2	7.4	7.5	7.6	7.3	9.9	8.8
8.7	8.4	9.2	8.0	7.2	6.9	8.3	8.4
9.8	9.0	8.2	8.1	8.9	8.0	9.4	9.0
6.9	7.0	7.1	7.2	10.0	8.0	8.9	8.5

Appendix VII

Raw scores of explosive power (centimetres)

Resistance Run Group		Mental Training Group		Combined Training Group		Control Group	
Initial	Final	Initial	Final	Initial	Final	Initial	Final
12	13	8	10	12	14	8	9
15	16	20	21	18	18	20	19
18	18	22	23	18	20	22	20
17	20	10	12	10	12	10	8
16	18	12	14	10	17	12	10
18	20	15	16	15	18	15	16
18	20	21	22	18	24	21	22
14	14	15	15	13	15	15	15
16	18	12	13	15	17	12	13
12	14	17	18	17	19	17	18
14	16	19	20	19	20	19	20
13	15	19	19	19	22	19	19
16	18	18	19	16	18	18	17
12	15	13	15	14	14	13	15
14	16	22	24	22	22	22	20
19	20	10	12	15	15	10	12
10	13	9	11	14	14	9	11
14	14	10	12	11	14	11	11
18	19	10	10	10	10	11	12
19	18	16	16	14	16	16	16
18	19	15	16	15	16	15	15
19	23	23	24	22	23	20	22
17	18	15	16	15	20	15	15
19	21	20	22	19	21	20	18
19	22	20	22	20	25	20	20
22	24	19	21	22	24	19	19
18	22	21	21	20	22	21	21
9	11	16	17	12	14	15	14
11	13	10	11	12	15	12	11
10	13	12	12	12	15	11	11

Appendix VIII

Raw scores of sports competition anxiety

Resistance Run Group		Mental Training Group		Combined Training Group		Control Group	
Initial	Final	Initial	Final	Initial	Final	Initial	Final
18	16	20	18	26	24	24	16
18	17	20	17	25	23	23	17
18	18	19	16	24	26	26	25
20	19	18	15	24	20	20	19
20	20	26	26	25	22	22	23
22	21	24	27	24	21	21	22
24	22	26	25	22	20	24	26
24	23	25	24	20	23	23	23
26	24	24	23	22	20	20	24
26	25	24	22	20	24	28	27
26	26	25	21	22	21	25	26
18	16	24	20	20	23	23	24
19	17	22	20	19	20	22	21
22	18	20	18	21	22	22	20
23	19	18	18	22	19	20	19
24	22	24	18	24	21	21	22
25	23	22	18	22	18	20	23
26	24	24	16	20	22	22	24
26	25	20	16	17	17	24	25
26	26	20	26	24	20	22	26
18	16	14	27	20	20	24	21
19	17	20	18	22	18	18	17
20	18	24	22	24	24	23	22
19	19	23	20	20	20	19	19
22	20	24	16	22	20	19	20
23	21	23	21	25	20	20	21
19	22	22	20	24	21	20	22
22	23	22	16	20	22	18	23
21	24	20	18	20	20	24	24
22	25	22	18	18	18	24	25

Appendix IX

Raw scores of achievement motivation

Resistance Run Group		Mental Training Group		Combined Training Group		Control Group	
Initial	Final	Initial	Final	Initial	Final	Initial	Final
2	1	6	3	6	5	7	8
3	2	7	6	8	5	22	20
4	4	3	2	10	8	15	16
5	4	7	6	12	10	20	18
6	5	3	3	10	12	21	22
7	6	4	5	9	10	18	20
8	6	5	5	8	7	14	12
10	10	22	18	9	6	18	16
9	7	20	10	10	4	19	18
10	8	10	6	11	3	15	18
11	11	12	7	12	10	14	10
12	10	10	8	13	12	12	10
13	10	15	10	14	15	10	12
14	12	15	12	15	16	5	10
15	13	15	13	16	12	8	8
16	12	22	18	17	16	7	9
17	14	22	18	18	12	6	12
15	12	18	16	19	10	9	10
18	15	12	10	20	12	12	12
19	18	5	3	21	20	14	7
20	18	18	16	16	5	15	10
21	20	13	10	22	18	12	14
22	20	16	14	15	7	18	19
21	21	18	15	14	12	22	12
20	21	15	12	16	8	20	22
19	18	17	15	12	12	14	16
18	14	20	18	14	9	8	10
17	14	19	19	16	10	9	12
16	16	18	16	15	10	10	8
15	14	18	14	14	10	12	12

Appendix X

Raw scores of self confidence

Resistance Run Group		Mental Training Group		Combined Training Group		Control Group	
Initial	Final	Initial	Final	Initial	Final	Initial	Final
32	32	32	30	32	29	29	28
30	31	28	25	31	27	27	28
29	30	32	24	29	24	26	26
26	24	28	28	30	25	26	26
25	24	32	30	27	27	27	26
27	24	28	27	29	26	27	27
27	25	31	32	28	25	28	28
28	26	31	27	27	24	28	28
28	27	32	26	24	30	27	26
28	28	30	27	30	29	25	26
29	29	28	24	32	26	24	25
31	30	30	26	30	24	27	28
32	29	29	25	32	25	26	27
32	31	28	24	32	27	27	30
27	28	27	25	32	32	27	27
25	24	30	30	30	29	27	27
30	30	26	25	30	27	28	28
26	26	29	24	30	26	26	27
28	24	27	26	32	32	30	30
30	26	27	27	30	26	29	29
25	24	29	27	30	28	27	26
26	25	29	26	29	26	26	24
26	24	29	26	30	27	25	24
25	24	28	27	29	26	27	25
28	24	29	28	30	26	24	26
27	25	28	27	30	26	28	26
30	26	26	27	30	25	27	24
29	27	27	25	29	24	26	25
29	28	30	26	30	25	25	27
26	24	32	25	30	24	24	25

Appendix XI

Raw scores of volleyball serving skill

Resistance Run Group		Mental Training Group		Combined Training Group		Control Group	
Initial	Final	Initial	Final	Initial	Final	Initial	Final
50	48	50	50	50	50	50	50
50	50	12	25	12	40	50	12
50	49	10	25	10	40	50	10
12	40	10	24	10	45	12	10
10	45	48	45	48	45	10	48
10	35	48	50	48	50	10	48
48	45	49	50	49	40	48	49
48	47	49	45	49	50	48	49
49	50	47	50	47	48	49	47
49	48	47	48	47	50	49	47
47	48	46	50	46	50	47	46
47	46	45	48	44	48	47	44
46	50	44	46	44	50	46	44
45	48	42	46	40	48	45	40
44	50	44	45	44	47	44	44
42	45	41	44	40	45	42	40
40	48	45	46	45	50	40	45
40	50	44	48	40	48	40	40
40	50	43	45	33	45	40	33
40	45	42	46	42	48	40	42
40	45	44	46	46	48	40	46
41	40	48	50	48	50	41	48
42	48	40	45	48	50	42	48
43	42	35	40	39	40	43	39
44	50	48	50	50	50	44	50
45	48	40	45	46	50	45	46
46	50	50	48	44	50	46	44
47	48	48	40	48	49	47	48
48	50	49	40	49	50	48	49
49	50	45	50	45	50	49	45

Appendix XII

Raw scores of volleyball volleying skill

Resistance Run Group		Mental Training Group		Combined Trained Group		Control Group	
Initial	Final	Initial	Final	Initial	Final	Initial	Final
45	48	48	44	49	51	46	48
24	40	43	59	59	61	49	51
37	48	37	21	44	64	43	31
20	40	58	52	46	56	38	27
28	35	43	40	21	23	22	23
23	44	21	34	48	58	24	24
36	46	48	49	51	49	49	49
38	59	51	45	31	59	59	59
57	60	31	30	34	44	43	44
58	60	34	44	38	45	44	46
54	50	38	50	32	34	59	55
41	44	32	49	34	37	41	43
48	55	24	59	44	44	44	44
51	59	49	55	46	56	33	36
31	43	59	60	59	61	32	34
40	36	43	44	43	36	49	46
48	40	44	42	36	48	59	59
32	37	59	54	38	48	44	43
44	58	21	28	37	51	45	36
49	43	27	23	58	60	36	38
48	50	23	36	43	60	40	46
44	48	24	38	41	59	50	59
45	51	49	58	48	50	35	33
59	60	59	50	51	66	23	30
58	65	44	45	31	52	36	38
55	59	46	48	34	51	38	37
59	60	59	60	38	50	37	38
21	27	43	45	32	44	45	43
28	30	44	54	34	48	43	46
25	40	46	59	44	52	42	44

Appendix XIII

Raw scores of volleyball spiking skill

Resistance Run Group		Mental Training Group		Combined Training Group		Control Group	
Initial	Final	Initial	Final	Initial	Final	Initial	Final
13	13	15	28	12	14	28	25
30	28	15	21	18	18	20	21
28	28	30	25	20	22	22	20
27	28	22	28	24	20	20	21
26	30	20	22	10	17	22	24
23	25	20	20	15	20	20	24
25	28	24	22	28	28	21	22
22	20	25	20	23	30	25	28
20	22	18	13	25	30	22	22
25	24	22	30	27	28	19	20
28	28	22	25	30	28	30	25
23	30	28	20	30	30	29	30
16	20	30	24	26	28	18	20
12	15	30	28	24	30	14	15
14	16	18	24	22	26	16	18
30	28	15	12	15	30	20	25
25	30	25	20	24	30	27	25
28	30	15	12	11	30	26	25
28	22	22	28	20	25	21	25
30	25	30	30	24	28	30	28
20	20	15	16	25	28	22	24
18	23	20	24	30	23	20	22
22	30	18	26	25	30	25	22
14	21	22	22	29	21	20	18
30	25	20	26	20	25	20	20
22	28	26	30	22	24	29	25
18	26	22	21	20	28	30	28
19	24	20	28	22	25	25	22
10	20	28	25	26	30	18	18
15	25	25	30	22	28	15	16

LIST OF PUBLICATIONS

- Jayakumar, S & Vairamani, S 2015, "The Effect of Three Different Training Methods on Motor and Psychological Variables among Men Volleyball Players" *International Journal of Applied Environmental Sciences,* vol. 10, no. 12, pp. 31727-31738, (Scopus Indexed)

- Jayakumar, S & Vairamani, S 2015 "The Effect Of 8 Weeks Of Resistance Training, Aerobic Training And Combined Training On Leg Explosive Power, Anxiety And Serving Among Women Volleyball Players" *International Journal of Applied Environmental Sciences,* vol. 10, no. 3, pp. 991-1005 (Scopus Indexed)

EFFECT OF RESISTANCE TRAINING, MENTAL TRAINING AND COMBINED TRAINING ON SELECTED MOTOR, PSYCHOLOGICAL AND VOLLEYBALL SKILL RELATED VARIABLES AMONG COLLEGE MEN VOLLEYBALL PLAYERS

A THESIS

Submitted by

JAYAKUMAR S

in partial fulfillment for the award of the degree of

DOCTOR OF PHILOSOPHY

Department of Physical Education and Health Science
FACULTY OF HUMANITIES AND SCIENCES

Dr. M. G. R.
EDUCATIONAL AND RESEARCH INSTITUTE
UNIVERSITY
(Declared as Deemed to be University u/s 3 of the UGC Act 1956)
CHENNAI 600095
(An ISO 9001: 2008 Certified Institution)

SEPTEMBER 2015

a volleyball player's workout.

cardio:

run 1-3 miles.

legs:

100 squats
100 leg raises
50 squat jumps
15 stair-jumps

core/abs:

100 sit-ups
100 push-ups
50 v-ups
90 second plank

arms:

100 dumbbell arm swings
100 bicep curls

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